

VOLUME I  
SECTION B

MAJOR HAZARD-SPECIFIC ELEMENTS

---

<b>CHAPTER B1.</b>	<b>ASBESTOS CONTROL</b>	<b>B1-1</b>
B0101.	CHAPTER ORGANIZATION	B1-1
B0102.	APPLICABILITY	B1-1
B0103.	DISCUSSION	B1-2
B0104.	ASBESTOS CONTROL ELEMENTS	B1-3
B0105.	TYPES OF ASBESTOS WORK PERFORMED ABOARD NAVY SHIPS	B1-7
B0106.	WORKPLACE RELEASE CRITERIA	B1-7
B0107.	PROTOCOL FOR SHIP'S FORCE PERFORMING NON-FRIABLE ASBESTOS MAINTENANCE	B1-7
B0108.	PROTOCOL FOR EMERGENCY ASBESTOS RESPONSE TEAM (EART) (FORMERLY THE 3-MAN EMERGENCY RIP-OUT TEAM)	B1-9
B0109.	PROTOCOL FOR INTERMEDIATE MAINTENANCE ACTIVITY (IMA) ASBESTOS MAINTENANCE/REPAIR	B1-11
CHAPTER B1 REFERENCES		B1-13
Appendix B1-A	ASBESTOS INSULATION BULK SAMPLE COLLECTION AND SUBMISSION PROCEDURE	B1-A-1
Appendix B1-B	STANDARD OPERATING PROCEDURES FOR SHIP'S FORCE PROTOCOL	B1-B-1
Appendix B1-C	STANDARD OPERATING PROCEDURES FOR EMERGENCY ASBESTOS RESPONSE TEAM (EART) PROTOCOL	B1-C-1
Appendix B1-D	STANDARD OPERATING PROCEDURES FOR THE INTERMEDIATE MAINTENANCE ACTIVITY ASBESTOS WORK PROTOCOL	B1-D-1
Appendix B1-E	TRAINING REQUIREMENTS FOR SHIP'S FORCE PROTOCOL	B1-E-1
Appendix B1-F	TRAINING REQUIREMENT FOR ASBESTOS-RELATED WORK	B1-F-1
Appendix B1-G	TRAINING REQUIREMENT FOR ASBESTOS-RELATED WORK	B1-G-1
Appendix B1-H	WORKPLACE RELEASE CHECKLIST	B1-H-1
Appendix B1-I	PERSONAL PROTECTIVE AND SPECIAL EQUIPMENT	B1-I-1
Appendix B1-J	AUTHORIZED EQUIPPAGE LIST FOR ASBESTOS WORK PROTOCOLS	B1-J-1
Appendix B1-K	PERSONAL PROTECTIVE AND SPECIAL EQUIPMENT	B1-K-1
Appendix B1-L	ASBESTOS REPAIR OR REMOVAL PREWORK BRIEF	B1-L-1
Appendix B1-M	PERSONAL PROTECTIVE AND SPECIAL EQUIPMENT	B1-M-1
<b>CHAPTER B2.</b>	<b>HEAT STRESS</b>	<b>B2-1</b>
B0201.	DISCUSSION	B2-1
B0202.	RESPONSIBILITIES	B2-2
B0203.	HEAT-STRESS ELEMENTS	B2-4
B0204.	HEAT-STRESS MONITORING AND SURVEYING	B2-4
B0205.	PHEL DETERMINATION	B2-11
B0206.	TRAINING	B2-14

**VOLUME I  
SECTION B**

**MAJOR HAZARD-SPECIFIC ELEMENTS (Continued)**

---

CHAPTER B2 REFERENCES .....	B2-14
Appendix B2-A PHEL CURVE GENERAL APPLICABILITY SELECTION.....	B2-A-1
Appendix B2-B HEAT STRESS TROUBLE-SHOOTING AND REPAIR ACTIONS.....	B2-B-1
Appendix B2-C USE OF THE WBGT METER.....	B2-C-1
Appendix B2-D HEAT STRESS SURVEY SHEET.....	B2-D-1
Appendix B2-E HEAT STRESS DECISION DIAGRAM.....	B2-E-1
Appendix B2-F TIME WEIGHTED MEAN (TWM) WBGT VALUES.....	B2-F-5
Appendix B2-G HEAT/COLD CASE .....	B2-G-1
 CHAPTER B3. HAZARDOUS MATERIAL CONTROL AND MANAGEMENT (HMC&M) .....	 B3-1
B0301. DISCUSSION .....	B3-1
B0302. SURFACE SHIP HMC&M .....	B3-2
B0303. SUBMARINE HMC&M .....	B3-7
 CHAPTER B3 REFERENCES .....	 B3-11
Appendix B3-A HAZARDOUS MATERIAL SPILL RESPONSE PROCEDURES (SURFACE SHIPS ONLY).....	 B3-A-1
Appendix B3-B MERCURY SPILL RESPONSE AND CLEANUP PROCEDURES (SURFACE SHIPS ONLY).....	 B3-B-1
 CHAPTER B4. HEARING CONSERVATION .....	 B4-1
B0401. DISCUSSION .....	B4-1
B0402. HEARING CONSERVATION RESPONSIBILITIES .....	B4-1
B0403. HEARING CONSERVATION ELEMENTS .....	B4-3
B0404. NOISE MEASUREMENT AND EXPOSURE ASSESSMENT .....	B4-3
B0405. NOISE ABATEMENT .....	B4-4
B0406. PERSONAL HEARING PROTECTIVE DEVICES .....	B4-4
B0407. HEARING TESTING AND MEDICAL EVALUATION .....	B4-5
B0408. TRAINING .....	B4-6
B0409. RECORDKEEPING .....	B4-6
 CHAPTER B4 REFERENCES .....	 B4-7
Appendix B4-A HEARING CONSERVATION DETAILED INFORMATION.....	B4-A-1
Appendix B4-B ADMINISTRATIVE CONTROL OF NOISE EXPOSURE WITH HEARING PROTECTIVE DEVICES (STAY TIME).....	 B4-B-1
Appendix B4-C ADDITIONAL NOISE ABATEMENT INFORMATION.....	B4-B-1
Appendix B4-D HEARING PROTECTIVE DEVICES.....	B4-D-1

VOLUME I  
SECTION B

MAJOR HAZARD-SPECIFIC ELEMENTS

---

<b>CHAPTER B5. SIGHT CONSERVATION .....</b>	<b>B5-1</b>
B0501. DISCUSSION .....	B5-1
B0502. PROGRAM RESPONSIBILITIES .....	B5-1
B0503. SIGHT CONSERVATION ELEMENTS .....	B5-2
B0504. DETERMINATION AND DESIGNATION OF EYE-HAZARDOUS AREAS/PROCESSES ..	B5-2
B0505. MEDICAL SURVEILLANCE .....	B5-2
B0506. ISSUE AND MAINTENANCE OF SIGHT PROTECTION EQUIPMENT .....	B5-2
B0507. TEMPORARY PROTECTIVE EYEWEAR .....	B5-3
B0508. EMERGENCY EYEWASH FACILITIES .....	B5-3
B0509. TRAINING .....	B5-4
CHAPTER B5 REFERENCES .....	B5-5
Appendix B5-A TYPES OF PROTECTIVE EYEWEAR.....	B5-A-1
 <b>CHAPTER B6. RESPIRATORY PROTECTION .....</b>	 <b>B6-1</b>
B0601. DISCUSSION .....	B6-1
B0602. RESPONSIBILITIES .....	B6-1
B0603. RESPIRATORY PROTECTION ELEMENTS .....	B6-2
B0604. TYPES OF RESPIRATORS AND THEIR APPLICATIONS .....	B6-3
B0605. RESPIRATOR SELECTION .....	B6-5
B0606. LIMITATIONS OF RESPIRATORS .....	B6-6
B0607. USE OF RESPIRATORS .....	B6-7
B0608. RESPIRATOR FIT TESTING .....	B6-8
B0609. INSPECTION, CLEANING, STORAGE AND MAINTENANCE OF RESPIRATORS ....	B6-8
B0610. ENTRY INTO IMMEDIATELY DANGEROUS TO LIFE OR HEALTH (IDLH) ATMOSPHERES .....	B6-10
B0611. BREATHING AIR REQUIREMENTS .....	B6-11
B0612. RESPIRATORY PROTECTION TRAINING .....	B6-12
B0613. RESPIRATORY PROTECTION EVALUATION .....	B6-13
B0614. MEDICAL EVALUATIONS .....	B6-13
B0615. SUBMARINE RESPIRATORY PROTECTION .....	B6-14
CHAPTER B6 REFERENCES .....	B6-18
Appendix B6-A MEDICAL CLEARANCE REQUEST.....	B6-A-1
Appendix B6-B TYPES OF RESPIRATORS.....	B6-B-1
Appendix B6-C Qualitative Respirator Fit Test Protocols.....	B6-C-1

VOLUME I  
SECTION B

MAJOR HAZARD-SPECIFIC ELEMENTS (Continued)

---

Appendix B6-D	MEDICAL QUESTIONNAIRE FOR POTENTIAL RESPIRATOR USERS .....	B6-D-1
Appendix B6-E	SPECIFIC RESPIRATOR DISQUALIFYING CONDITIONS.....	B6-E-1
<b>CHAPTER B7.</b>	<b>ELECTRICAL SAFETY .....</b>	<b>B7-1</b>
B0701.	DISCUSSION .....	B7-1
B0702.	RESPONSIBILITIES .....	B7-1
B0703.	ELECTRICAL SAFETY ELEMENTS .....	B7-2
B0704.	WORKING ON DE-ENERGIZED EQUIPMENT .....	B7-2
B0705.	WORKING ON ENERGIZED EQUIPMENT .....	B7-3
B0706.	PERSONAL PROTECTIVE EQUIPMENT (PPE) .....	B7-3
B0707.	PORTABLE ELECTRICAL TOOL ISSUE (Not applicable to submarines) ...	B7-3
B0708.	TRAINING .....	B7-4
CHAPTER B7	REFERENCES .....	B7-4
<b>CHAPTER B8.</b>	<b>GAS FREE ENGINEERING .....</b>	<b>B8-1</b>
B0801.	DISCUSSION .....	B8-1
B0802.	PRECAUTIONS .....	B8-1
B0803.	GAS FREE ENGINEERING SUBSECTIONS .....	B8-2
CHAPTER B8	REFERENCES .....	B8-2
<b>CHAPTER B9.</b>	<b>RADIATION SAFETY .....</b>	<b>B9-1</b>
B0901.	DISCUSSION .....	B9-1
B0902.	RESPONSIBILITIES .....	B9-1
B0903.	GUIDANCE .....	B9-2
B0904.	RADIATION HAZARD AREAS .....	B9-4
B0905.	MEDICAL SURVEILLANCE .....	B9-5
B0906.	RADIATION INCIDENTS .....	B9-5
CHAPTER B9	REFERENCES .....	B9-6
Appendix B9-A	SIGNS AND STOCK NUMBERS .....	B9-A-1
<b>CHAPTER B10.</b>	<b>LEAD CONTROL .....</b>	<b>B10-1</b>
B1001.	DISCUSSION .....	B10-1

VOLUME I  
SECTION B

MAJOR HAZARD-SPECIFIC ELEMENTS

---

B1002. PERMISSIBLE EXPOSURE LIMIT AND ACTION LEVEL TRIGGERING	
REQUIREMENTS .....	B10-1
B1003. LEAD CONTROL RESPONSIBILITIES .....	B10-2
B1004. LEAD CONTROL ELEMENTS .....	B10-3
B1005. INDUSTRIAL HYGIENE SURVEY .....	B10-3
B1006. CONTROL OF LEAD IN THE WORKPLACE ENVIRONMENT .....	B10-4
B1007. WASTE DISPOSAL PROCEDURES .....	B10-6
B1008. MEDICAL SURVEILLANCE .....	B10-6
B1009. WRITTEN COMPLIANCE PLAN .....	B10-7
B1010. TRAINING .....	B10-8
CHAPTER B10 REFERENCES .....	B10-9
CHAPTER B11. TAG-OUT .....	B11-1
B1101. DISCUSSION .....	B11-1
B1102. TAG-OUT SUBSECTIONS .....	B11-1
CHAPTER B11 REFERENCES .....	B11-2
CHAPTER B12. PERSONAL PROTECTIVE EQUIPMENT .....	B12-1
B1201. DISCUSSION .....	B12-1
B1202. RESPONSIBILITIES .....	B12-1
B1203. PROTECTIVE EQUIPMENT .....	B12-1
Appendix B12-A PPE STOCK NUMBER INFORMATION.....	B12-A-1
ANNEXES	
G Glossary .....	G-1
I Index .....	I-1

## SECTION B

### MAJOR HAZARD-SPECIFIC PROGRAMS

This section outlines NAVOSH programs which address specific hazards such as asbestos control, heat stress, radiation protection, electrical safety, hazardous material control management, and gas free engineering as well as the tag-out program and personal protective equipment. The objective of this section is to reduce to a manageable degree, the basic NAVOSH management requirements applicable to shipboard personnel. This section is addressed to personnel who would assist the commanding officer in program management (e.g., safety officer, electrical safety officer, gas free engineer, HM coordinator, and medical department representative).

To execute these programs, it may be necessary to consult other Navy publications such as the Naval Ships Technical Manual (NSTM), General Specifications for Ships, technical/operating manuals, and equipment Planned Maintenance Systems (PMS) cards for complete safety precautions.

It must be recognized that there may be conditions that are not covered in this manual. If a NAVOSH standard does not exist, the Type Commander shall be notified via the chain of command. The Type Commander will determine, considering the chain of command input, if there is an applicable OSHA standard and how the OSHA standard shall apply considering if there are military unique requirements/design configurations that prevent compliance with the OSHA standard. The Type Commander or other commanders in the chain of command, if sufficiently knowledgeable, shall provide guidance to all ships under their command as to the standards to be followed.

**CHAPTER B1**  
**ASBESTOS CONTROL**

**B0101. CHAPTER ORGANIZATION**

a. The chapter has been reorganized to clarify ships' requirements and responsibilities for control of asbestos exposure.

b. All U.S. Navy ships are required to have an asbestos control plan per B0102. The scope, requirement and responsibilities for each ship's plan are determined by the type of asbestos work that each ship's personnel are permitted to perform. The type of work performed, and therefore, the type of asbestos control plan required, is based on:

(1) The type of asbestos-containing materials (ACM) present aboard the ship (see B0103e(1) - (2))

(2) Whether the ship has a mission to provide asbestos repair and/or removal services to other afloat commands.

c. There are three categories of asbestos work that can be performed aboard ship (paragraph B0105). These categories are referred to in this chapter as asbestos work protocols. Individual asbestos work protocols, which detail plan work scope, plan responsibilities, and equipment and training requirements, are included for each type of asbestos work.

d. This chapter contains two types of information. Paragraphs B0101 through B0106 contain information that is general in nature, and is mandatory for all ships. Paragraphs B0107 through B0109 detail information that is applicable to ships relative to the asbestos work protocol under which the ship must operate (paragraph B0105).

**B0102. APPLICABILITY**

Navy policy is that asbestos-contaminated insulating materials will not be used on U.S. ships. Naval Sea Systems Command (NAVSEASYS COM) cannot definitively establish that a ship is free of ACM. Any previous guidance that may have exempted ships from establishing and maintaining an asbestos plan has been deleted from reference B1-1. Because of this, and the fact that all U.S. Navy ships contain some form of ACM, **all ships shall implement and maintain an asbestos control plan. Commanding officers shall ensure that all required resources and personnel are assigned to accomplish this plan.** Ships with qualified teams to perform asbestos repair or removal may do so. However, due to inconsistent State-to-State, and increasingly stringent Federal air emissions reporting requirements, each ship is required to contact their type commander (TYCOM) industrial hygiene officer (IHO) and/or Regional Environmental Coordinator (REC) to determine specific local emissions reporting guidance.

a. All ships shall implement, at a minimum, the protocol for ship's force (paragraphs B0105a and B0107). A ship may be required to implement and maintain an additional protocol - either the protocol for Emergency Asbestos Response Team (EART) (paragraphs B0105b and B0108) or Intermediate Maintenance Activity (IMA) (paragraphs B0105c and B0109). No afloat command will be required to implement all three asbestos work protocols.

b. Any ship whose keel was laid prior to 1980 will be considered to contain friable asbestos thermal systems insulation (TSI), and shall therefore

maintain an EART. Ships in this category shall implement and maintain both the ship's force (B0107) and EART (B0108) protocols.

c. Any ship whose keel was laid during or after 1980, per reference B1-2, was prohibited from being constructed with TSI, and by definition, not require an EART. TSI repair work performed by facilities and contractors controlled by U.S. Maritime regulations prevented asbestos TSI from being introduced onto the ship. Those same regulations were not always enforceable for work conducted by non-U.S. regulated repair facilities or contractors. See Note below for details.

**NOTE:**

Any ship that has had TSI repair work performed in any non-U.S. Navy regulated facility or contractor, should be handled as if the ship contains asbestos TSI, unless supporting documentation, substantiated by laboratory analysis (see B0104a(3)), can document that ACM was not introduced onto the ship. **Any ship, having any TSI repairs by any non-U.S. regulated facility or contractor, without supporting documentation to guarantee that no ACM was introduced onto the ship, regardless of the age of the ship, shall maintain an EART.** Therefore, all ships shall maintain, or have access to, adequate supplies of asbestos-free insulating materials for use in routine and emergency repair work conducted in non-U.S. operated facilities to prevent the introduction of ACM.

A non-U.S. regulated facility or contractor is defined as **"any facility or contractor outside the direct controls of the contracting official for all materials and work practices used during the repair"**.

d. Any ship having Intermediate Maintenance Activity (IMA) capabilities and an embarked IHO is authorized to have its qualified personnel remove unlimited amounts of ACM, onboard or aboard other ships for which it is responsible to provide maintenance support. Repair and removal operations conducted at sea, >3nm of shore are not subject to Environmental Protection Agency (EPA) emission standards for asbestos. However, EPA standards for disposal of ACM apply upon return to port (B0104f). Any ship so capable (designated) shall implement and maintain both the ship's force (B0107) and (B0109) IMA asbestos control protocols.

**B0103. DISCUSSION**

a. Asbestos is a fibrous mineral that can be produced into a material that is fireproof, possesses high tensile strength, good heat and electrical insulating capabilities, and moderate to good chemical resistance. Because of these characteristics, asbestos has traditionally been used as thermal and acoustical insulation, pipe lagging, gaskets, brake and clutch linings, winch and capstan brakes, and roofing and flooring materials.

b. Asbestos fibers are a known health hazard. Inhalation of asbestos fibers has been demonstrated to cause at least two distinct disease states, asbestosis and cancer. Asbestosis is a progressively worsening disease of the lung and is recognized as a classic disabling or even fatal occupational disease. Asbestos has also been found as a causal factor in the development of lung cancer and of malignant pleural mesothelioma, and it is suspected of causing cancer of the gastrointestinal tract. When coupled with smoking tobacco products, the risk of developing lung cancer is increased dramatically. Mesothelioma is a rare malignant tumor of the membrane that lines the chest and abdominal cavity. It is rarely found except in those



exposed to asbestos. Most symptoms of these asbestos-related diseases do not show up until 10-45 years after exposure.

c. Asbestos insulation and other asbestos-containing materials are normally not a health hazard when in good condition, secured in place, and unlikely to be disturbed. Bound asbestos materials, such as most gaskets, floor coverings, and cements are not generally health hazardous except when worked by punching, grinding, machining, or sanding or when the material is deteriorated. Of primary concern is asbestos that has the potential to become airborne through friability (able to be crushed under hand pressure). Gasket material that has been exposed to high heat over time, and damaged asbestos packing materials may also be friable.

d. There are no known acute (immediate) effects associated with exposure to asbestos. Therefore, avoid breathing asbestos dust even though it may not seem to produce any harmful effects at the time of exposure. There is only one way to completely prevent the possibility of asbestos-related illness, and that is to eliminate asbestos from the work environment. Since total removal is not possible, the Navy has instituted a plan to control the use of asbestos and to replace any removed asbestos with a non-asbestos substitute where technically acceptable substitutes have been identified.

e. Asbestos is normally found aboard ship in insulation and lagging for high temperature machinery, boilers and piping, in Garlock®-type gasket material, electrical wiring, certain deck tiles and decorative paneling, and some packing material. For purposes of this afloat instruction, ACM is characterized as one of two types:

(1) **Friable**. Friable ACM is defined as material that can be crumbled, pulverized or reduced to powder under hand pressure, thereby releasing airborne fibers. Friable ACM represents the most significant health hazard, because airborne fibers can be released during normal work operations. Typical examples are:

- (a) Pipe lagging
- (b) Acoustical insulation
- (c) Sheet gasket material used in high temperature applications.

(2) **Non-friable**. This form of ACM, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure. The asbestos fibers in these materials cannot be readily released into the air under normal work conditions. Some examples are:

- (a) Brake and clutch linings
- (b) Gaskets and adhesives
- (c) Floor tile and adhesives.

#### **BO104. ASBESTOS CONTROL ELEMENTS**

##### **a. Identification of Asbestos Hazards**

(1) Per chapter A3, an industrial hygienist shall survey all work places as part of the industrial hygiene survey. During this survey, the industrial hygienist shall identify any hazards associated with asbestos and provide recommended actions to the ship to eliminate or minimize the asbestos hazard.

(2) It is necessary to determine if thermal insulation, due to be handled by Ship's force for repair or removal, contains asbestos, prior to the time each repair or removal is to be performed. For non-nuclear propulsion spaces, a sample of the insulation material shall be obtained following the procedures in appendix B1-A, and submitted for analysis.

R)

(3) For nuclear propulsion spaces, a thorough determination for the presence of asbestos prior to initiating thermal insulation shall be conducted. Reliable documentation, such as ship's drawings, work control documents, material history drawings, and prior sample results may be used to determine whether the material to be worked is free of asbestos. If documentation is unavailable, unreliable, or questionable, a sample of the insulation material shall be obtained following the procedures of appendix B1-A and submitted for analysis.

R)

(4) It is impossible to identify asbestos based solely on a visual inspection. Therefore, thermal insulation, especially on ships that were built before 1980, should be handled as if it contains asbestos, unless the insulation material is shown to be asbestos-free by laboratory analysis, or for nuclear propulsion plant spaces by reliable documentation addressed in the preceding paragraph. Ships having asbestos identification capability can provide this laboratory service, to positively identify suspected asbestos-containing materials. Shipyards, Navy Environmental Preventive Medicine Units (NAVENPVNTMEDUs), and medical treatment facilities (MTFs) also have the capability to test materials for the presence of asbestos. Identification by polarizing light microscopy or transfer electron microscopy (TEM) is acceptable.

(5) There are many means of marking asbestos-free thermal insulation. Do not rely on any such systems as positive identification of non-asbestos material.

**b. Control of Asbestos in the Workplace**

(1) Navy policy is to eliminate asbestos exposure hazards by substitution of ACM with asbestos-free materials, approved under the technical management of the NAVSEASYS COM. The command shall not remove installed ACM, which are in good condition, for the sole purpose of eliminating asbestos. Where substitution is not possible, the command shall use engineering controls or and/or personal protective equipment. The command shall prohibit the use of administrative controls, (e.g. personnel rotation) as a means of keeping the exposure below the permissible exposure limit (PEL).

(2) Specific procedures to control the accumulation of asbestos-laden waste, dust, and scrap materials are found in the individual work protocol standard operating procedures (SOPs) (Appendix B1-B for ship's force, appendix B1-C for Emergency Asbestos Response Team, and appendix B1-D for IMAs).

**(3) Warning Signs and Labels**

(a) The command shall provide and display warning signs, which comply with reference B1-3, at each location where asbestos work is performed. Post signs at a sufficient distance from the work area that personnel may read the signs and take necessary steps before entering the area. A listing of required protective equipment may be attached to, or be a part of the sign. The warning sign shall state:

**DANGER**

**ASBESTOS**

**CANCER AND LUNG DISEASE HAZARD**

**AUTHORIZED PERSONNEL ONLY**

**RESPIRATORS AND PROTECTIVE CLOTHING MAY BE REQUIRED IN THIS AREA**

This warning sign is available from standard stock under NSN 9905-01-345-4519.

(b) Affix warning signs to containers of raw materials, mixtures, scrap, waste, debris, samples and other products containing asbestos materials. Print the warning labels in letters of sufficient size and contrast as to be readily visible and legible. Include the following information:

**DANGER**

**CONTAINS ASBESTOS FIBERS**

**AVOID CREATING DUST**

**CANCER AND LUNG DISEASE HAZARD**

c. **Adherence to Prescribed Work Practices.** The work processes for asbestos removal or repair are specific to the type of asbestos work protocol. See the appropriate appendix for SOPs for each work protocol:

- (1) Appendix B1-B details SOPs for ship's force asbestos work
- (2) Appendix B1-C is the SOPs for EART work processes
- (3) Appendix B1-D covers operating procedures for the IMA processes.

d. **Proper Stowage and Offloading of Materials Containing Asbestos**

(1) **Stowage of Unused Asbestos-Containing Gasket Materials and Packing.** Stow asbestos-containing gasket material and packing (i.e. Garlock sheets) in double, heavy-duty (6 mil thickness) plastic bags or other suitable impermeable containers. The storage material must be leak tight. All bags or containers must be provided with standard asbestos labels (paragraph B0104b(3)(b)). Exercise care in order to prevent bags and other containers from rupturing when being transported and stowed.

(2) **Handling, Packaging and Offloading of Removed ACM.** Adequately wet ACM during removal and maintain wet through disposal. Dispose of the wet waste material in double, heavy-duty (6 mil thickness) plastic bags or other suitable impermeable containers. The waste container must be leak tight. Do not overfill the bags. Provide all bags or containers with standard warning labels per B0104b(3)(b). Distinctly color-code all asbestos waste containers red to ensure easy recognition. Exercise care in order to prevent bags and other containers from rupturing when being transported to a shore activity for disposal. Accomplish disposal in accordance with OPNAVINST 5090.1B, appendix L.

e. **Asbestos Medical Surveillance Program (AMSP).** The medical department representative (MDR) will determine placement of personnel into the AMSP per reference B1-4. It is possible that all three asbestos protocols may require placement of personnel into an AMSP.

f. **Environmental Protection**

(1) Repair and removal operations conducted at sea, at a distance greater than 3nm from U.S. shore, are not subject to Environmental Protection Agency (EPA) emissions and reporting standards for asbestos. However, EPA standards for disposal of ACM apply upon return to port. All ACM will be held on station and disposed of ashore per the appropriate EPA requirements.

(2) Ships with qualified teams to perform asbestos repair or removal may do so within 3nm of shore. However, due to inconsistent State-to-State, and increasingly stringent Federal air emissions reporting requirements, each ship is required to contact their TYCOM IHO or REC to determine specific local emissions reporting guidance.

g. **Training**

(1) Training requirements for personnel performing repair or removal work with ACM are specific to the type of work performed. Each protocol contains the specific requirements for training. The training matrices are as follows:

(a) Training matrix for ship's force is appendix B1-E

(b) Training matrix for the EART is appendix B1-F

(c) Training matrix for IMAs is appendix B1-G

(2) In addition to the training requirements detailed in the specific protocols (B0107c, B0108c and B0109d), general training is required for all personnel currently exposed, or with the potential for being exposed to asbestos. All commands are responsible for asbestos training of their personnel. Training should be conducted by the workcenter supervisor upon assignment. General training shall include:

(a) The health effects/hazards of asbestos

(b) The association between the use of tobacco products, exposure to asbestos, and the increased risk of developing lung cancer

(c) Uses of asbestos which could result in an exposure

(d) Engineering controls and work practices associated with an individual's work assignment

(e) Purpose, proper use and limitations of protective equipment

(f) Purpose and description of medical surveillance program

(g) Description of emergency and clean-up procedures

(h) Overall review of this chapter and the command's/activity's control plan

(i) Posting signs and affixing labels.

(3) **Recordkeeping.** All shipboard asbestos records, including personal and environmental monitoring, quality control and quality assurance, and asbestos related respirator fit testing, shall be transferred to a supporting shore medical activity for permanent retention as required by reference B1-4 following transfer, discharge or retirement of the individual to whom the records refer. The supporting shore medical activity shall establish a file

for each ship. If a ship changes homeport, the file will be provided to the new supporting shore medical activity. Upon decommissioning, the supporting shore medical activity shall forward the asbestos record to BUMED. Each individual currently or previously working with asbestos or any other person he or she may designate, shall have access to all such records within 15 days of a written request.

(4) Training materials are available through NAVOSHENVTRACEN at [www.norva.navy.mil/navosh](http://www.norva.navy.mil/navosh).

#### **B0105. TYPES OF ASBESTOS WORK PERFORMED ABOARD NAVY SHIPS**

For the purposes of this chapter, all work involving ACM has been divided into three protocols. The protocols are:

a. **Ship's Force Protocol**. This protocol details the requirements and procedures for the repair and removal of materials that contain non-friable ACM (B0107). All afloat commands must comply with the requirements of this protocol.

b. **Emergency Asbestos Response Team (EART) Protocol (Formerly the 3 Men Emergency Rip-Out Team)**. This protocol details the requirements and procedures for the minor repair and removal of friable ACM (i.e. asbestos work that can be accomplished using proper glove bag procedures (B0108)).

c. **Intermediate Maintenance Activity Protocol**. This protocol details the requirements and procedures for major asbestos removals and repairs by ships having IMA capabilities and an embarked IHO assigned. Major asbestos removals and repairs are defined as any asbestos work that cannot be accomplished using a single glove bag (B0109). An IMA capable ship, with an embarked IHO, will not be required to maintain an EART.

#### **B0106. WORKPLACE RELEASE CRITERIA**

a. Strict adherence to good housekeeping procedures, and dust control measures to minimize release of asbestos fibers during removal/repair of asbestos-containing materials are the most important and effective means of reducing downtime to reoccupy a workspace after asbestos repair or abatement operations.

b. Before a space, where asbestos work was performed, may be released for unrestricted access, the area must be thoroughly cleaned and inspected. Use the checklist found in appendix B1-H for this purpose if required by the protocol.

#### **B0107. PROTOCOL FOR SHIP'S FORCE PERFORMING NON-FRIABLE ASBESTOS MAINTENANCE**

a. All Navy ships have non-friable asbestos, therefore, all afloat commands shall comply with the specific requirements of this protocol. The SOPs for the work processes authorized for ship's force personnel to perform are found in appendix B1-B. Additionally, all afloat commands are required to comply with the general requirements detailed in B0101 through B0106. Ship's force may perform:

- (1) Replacement of asbestos-containing gasket/packing material
- (2) Limited asbestos floor tile removal (9 ft<sup>2</sup> maximum)
- (3) Preventive maintenance of brake and clutch assemblies.

b. **Ship's Force Protocol Responsibilities**

(1) **The safety officer shall:**

(a) Ensure that ship's force personnel performing work under this protocol are trained to accomplish the work described in appendix B1-B.

(b) If applicable (see B0102c NOTE), ensure that documentation, substantiated by laboratory analysis (see B0104a(3)), is obtained for any repair work performed in non-U.S. Navy-operated facility to ensure that no ACM is introduced onto the ship.

(2) **The engineering/repair/aviation intermediate maintenance department heads (as appropriate) shall:**

(a) Provide personnel who work with asbestos with the necessary equipment and protective clothing to perform work per this protocol. Appendix B1-I and appendix B1-J detail the personal protective equipment (PPE) and authorized equipment list (AEL) required for this protocol.

(b) Identify all personnel involved in asbestos repair or removal operations that warrant AMSP consideration, per this protocol (see appendix B1-B, Medical Surveillance Sections), and provide their names to the MDR for consideration for inclusion in the AMSP. Ensure personnel, placed in the AMSP by the MDR, report for medical examinations as required.

(c) Ensure that all asbestos-containing waste materials are collected as required per B0104d(2) and appendix B1-B and properly stored while awaiting disposal ashore (B0104d(1) and (2)).

(d) Ensure that only work described in paragraph B0107 is performed by ship's force.

(e) Ensure that ship's force personnel performing work under this protocol are trained to accomplish the work described in appendix B1-B.

(3) **The medical department representative shall** implement, if applicable, an AMSP, per reference B1-4 for personnel performing preventive maintenance on brake assemblies.

(4) **Division officers shall:**

(a) Notify the safety officer and engineer officer/repair officer prior to performing or authorizing any work that may include the repair or removal of ACM.

(b) Ensure that the workplace is properly cleaned and cleared prior to release for uncontrolled access per B0106 and appendix B1-H. The department head or division officer may designate a leading petty officer (LPO) to accomplish the workplace release inspection.

(c) Ensure that all mandatory training for work covered in this protocol is conducted. Training requirements are detailed in B0109 and appendix B1-E.

(5) **Workcenter supervisors shall** train all hands who work in areas where asbestos-containing materials are present to recognize and report damaged ACM. Training materials are available through NAVOSHENVTRACEN at [www.norva.navy.mil/navosh](http://www.norva.navy.mil/navosh).

(6) **All hands shall:**

(a) Avoid areas posted with asbestos warning signs. Unless authorized, do not enter an asbestos-posted area.

(b) Inform appropriate supervisor of damage to materials covered under this protocol.

c. **Training**

(1) All personnel currently exposed or with the potential of being exposed to asbestos and their division officer and work center supervisor shall receive asbestos training prior to, or at the time of their initial assignment.

(2) Training materials are available through NAVOSHENVTRACEN at [www.norva.navy.mil/navosh](http://www.norva.navy.mil/navosh).

d. **Personal Protective and Engineering Equipment.** A matrix containing a general list of personal protective equipment (PPE) for work covered in this protocol is found in appendix B1-I. A detailed list of all engineering equipment (AEL) is found in appendix B1-J.

e. **Disposal of Asbestos Waste.** Dispose of asbestos waste per B0104d(2), appendix B1-B, and chapter B3.

**BO108. PROTOCOL FOR EMERGENCY ASBESTOS RESPONSE TEAM (EART) (FORMERLY THE 3-MAN EMERGENCY RIP-OUT TEAM)**

a. All afloat commands meeting the following criteria shall have an EART to perform emergency repair or replacement of ACM. Each EART team shall consist of a supervisor, a cutter, and a cleaner. Per B0102, the following afloat commands shall maintain an EART:

(1) Any ship whose keel was laid prior to 1980

(2) Any ship whose keel was laid on or after 1980, not meeting the exemption for new ships detailed in B0102c NOTE

**NOTE:**

A ship that is designated as an IMA with asbestos removal capabilities, and an embarked IHO does not need to maintain an EART.

(3) Ships requiring the EART shall comply with all of the general requirements of this chapter (paragraphs B0101 through B0106), the requirements of the protocol for ship's force (Section B0107), and the specific requirements of this protocol (B0108b through B0108f).

(4) The EART may perform:

(a) All work described in the protocol for ship's force per B0107.

(b) Asbestos repair or removal, limited to small-scale, short-duration repair or maintenance actions. Small-scale, short-duration actions are such tasks as minor repairs of asbestos-containing insulation on pipes. The definition of a minor repair includes removal and reinstallation of less than 3 linear feet of pipe insulation or less than 1 square foot (ft<sup>2</sup>) of insulation on surfaces other than pipe (an amount that can be done within a

glove bag). The standard operating procedure for this action is found in appendix B1-C and reference B1-1.

b. **Emergency Asbestos Response Team (EART) Responsibilities**

(1) **The safety officer shall:**

- (a) Inspect each repair operation involving friable asbestos.
- (b) Ensure that the ship has the required equipment to accomplish work per this protocol as defined in reference B1-1 and appendix B1-J.
- (c) When asbestos removal or repair operations are completed, approve access to work area using the release criteria per B0106 and complete appendix B1-H.

(2) **The engineering/repair department head (as appropriate) shall:**

- (a) Ensure that a qualified IMA (either afloat or shore) is scheduled to do the work, if asbestos work exceeds the scope of this protocol
- (b) Provide personnel who work with asbestos, per this protocol, with the necessary equipment and protective clothing per reference B1-1 and appendix B1-K.
- (c) Identify and provide a list of all personnel involved in asbestos operations to the medical department representative for consideration for entry into the AMSP.
- (d) Ensure that all asbestos-containing waste materials are collected, stowed and disposed of as required by paragraph B0104d(2) and chapter B3.
- (e) Ensure personnel are trained, and training is documented in the member's service record. Training requirements for this protocol are located in appendix B1-F.
- (f) If a repair or removal of ACM, involving an IMA is scheduled, interface with the IMA personnel and attend the pre-work brief per B0109(c).

(3) **The division officer of the workspace where asbestos work is being conducted shall** attend the asbestos pre-work brief if required asbestos work exceeds the scope of this protocol (paragraph B0108a(4)(b) and appendix B1-L).

(4) **The MDR shall** implement an AMSP, per reference B1-4.

c. **Training**

- (1) All members of the EART shall be graduates of Shipboard Asbestos Response Course, CIN A-760-2166. (See appendix B1-F).
- (2) This training shall be documented in the member's service record upon completion.

d. **Personal Protective Equipment.** Personnel engaged in work per this protocol, shall wear the protective clothing and equipment discussed in the appendix B1-K. A list of equipment and tools can be found in appendix B1-J.



**NOTE:**

Critical watchstanders, personnel who must remain in the immediate area, due to watchstanding requirements, where asbestos repair or removal is being conducted, are required to wear the same PPE as those personnel performing the asbestos work, and at least a half-mask, air purifying respirator with a filtering cartridge.

e. **Disposal of Asbestos Waste.** Dispose of asbestos waste per appendix B1-C and chapter B3.

f. **Medical Surveillance Requirements.** Per references B1-1 and B1-4, a list of EART personnel shall be submitted to the medical department for consideration for entry into the command's AMSP.

**B0109. PROTOCOL FOR INTERMEDIATE MAINTENANCE ACTIVITY (IMA) ASBESTOS MAINTENANCE/REPAIR**

a. This protocol details the requirements and procedures for major asbestos removals and repairs. Major asbestos removals and repairs are defined as any asbestos work that cannot be accomplished using a single glove bag. Work under this protocol will be accomplished by afloat commands that have been designated as an IMA, with an embarked IHO. Shore IMA facilities, and in some situations, private contractors, may be used to conduct asbestos insulation removal.

**NOTE:**

Do not use this protocol for IMAs without an embarked IHO

Work under this protocol may include:

- (1) Any work described in the ship's force protocol (B0107)
- (2) The removal and repair of unlimited quantities of ACM
- (3) Work under this protocol will be performed using the provisions in appendix B1-D.

b. **Asbestos Control Plan Responsibilities**

(1) **The IHO shall:**

(a) Inspect each area where a repair or replacement operation involving friable asbestos is scheduled.

(b) When asbestos removal or repair operations are completed, approve access to work area using appendix B1-H.

(c) If asbestos work is scheduled to be provided to another afloat command, initiate, organize and participate in the pre-work brief located in appendix B1-L.

(d) Provide area clearance air sampling and analysis, as well as asbestos identification for the ship and tended units per reference B1-1.

(e) Ensure that individual(s) trained to analyze bulk and air samples participate and are rated "proficient" in the NIOSH Proficiency Analytical Testing (PAT) program for asbestos air samples and the Navy's Research Triangle Institute (RTI) program for asbestos bulk identification.

(f) Maintain records and appropriate logs of asbestos air sampling, asbestos identification, equipment calibration and analysis per reference B1-5.

(g) Follow the guidance of appendix B1-D for defining (PPE) and engineering controls during asbestos removal operations. A summary of PPE required is provided in appendix B1-M. A detailed list of all equipment can be found in appendix B1-J.

(2) **The engineering/repair department head (as appropriate) shall:**

(a) Provide personnel who work with asbestos, per this protocol, with the necessary equipment and protective clothing, per Appendices B1-D and B1-M.

(b) Identify and provide a list of all personnel involved in asbestos operations to the MDR for consideration for entry into the AMSP. Ensure personnel report for medical examinations as required.

(c) Ensure that all asbestos-containing waste materials are collected, stowed and disposed of as required by paragraph B0104d(2) and appendix B1-D and chapter B3.

(d) Ensure personnel are trained, and training is properly documented in the member's service record. Detailed training requirements for this protocol can be found in appendix B1-G.

(3) **The MDR shall:**

(a) Implement an AMSP, per reference B1-4.

(b) Provide training on the health and medical effects of asbestos, upon request. Training materials are available through NAVOSHENVTRACEN at [www.norva.navy.mil/navosh](http://www.norva.navy.mil/navosh).

c. **Asbestos Pre-Work Brief**

(1) Except for the afloat IMA, all other afloat commands are prohibited from conducting the removal and/or repair of unlimited quantities of ACM. Therefore, it is necessary that the afloat IMA provide services to other afloat commands who, under operational emergencies, require immediate repair or removal of ACM that is beyond the scope of their specific asbestos work protocol.

(2) Afloat commands that have been designated as IMAs, with an embarked IHO, will, from time-to-time, be asked to provide asbestos repair and/or removal services to other afloat commands. Prior to conducting asbestos operations onboard another ship, the IMA will conduct an asbestos pre-work brief with the receiving ship's engineering officer, safety officer, medical officer, division officer and the LPO of the space where the work will take place.

(3) A sample pre-work brief appears in appendix B1-L. The pre-work brief shall be signed by the engineer officer/repair department head from the ship receiving asbestos services, as well as by the IMA IHO. The completed and signed form shall be retained at the IMA.

d. **Training**

(1) All members of the IMA asbestos removal team shall be graduates of Asbestos Supervisor/Worker (CIN A-493-0069) prior to or at the time of their initial assignment. They shall attend Asbestos Supervisor/Worker Refresher (CIN A-493-0070) annually thereafter (See appendix B1-G).

(2) This training shall be documented in the member's service record.

e. **Personal Protective Equipment.** Personnel engaged in handling asbestos-containing material shall wear the provided protective clothing discussed in appendices B1-D and B1-M. A detailed list of all equipment and tools for work under this protocol can be found in appendix B1-J.

f. **Disposal of Asbestos Waste.** Dispose of asbestos waste per B0104d(2), appendix B1-D, and chapter B3.

g. **Medical Surveillance Requirements.** All designated IMA personnel will be enrolled in the command's AMSP per reference B1-4.

---

**CHAPTER B1**

**REFERENCES**

- B1-1 Naval Ship's Technical Manual, chapter 635, Thermal Insulation (NOTAL)
- B1-2 Title 29 Code of Federal Regulations (CFR), section 1915.1001, Asbestos Exposure in all Shipyard Employment Work (NOTAL)
- B1-3 Title 29 Code of Federal Regulations (CFR) section 1910.1001 (As amended), NOTAL (Not required on board ship, but a pertinent reference) (NOTAL)
- B1-4 NEHC Technical Manual, Medical Surveillance Procedures Manual and Medical Matrix (NOTAL)
- B1-5 NEHC Technical Manual, Industrial Hygiene Field Operations Manual (NOTAL)

**Appendix B1-A**

**ASBESTOS INSULATION BULK SAMPLE COLLECTION AND SUBMISSION PROCEDURE**

To determine if the thermal insulation to be handled for repair or rip-out is indeed asbestos, a sample of the material must be submitted to the Industrial Hygiene Department of any NAVENPVNTMEDU, Naval Hospital or Naval Medical Clinic, or to the IHO/safety officer aboard a tender or repair ship for immediate analysis. Following are procedures for collecting a sample suspect asbestos material:

a. Restrict access within 10 feet of the area in which sampling is to be done to only personnel wearing a National Institute for Occupational Safety and Health (NIOSH)-approved half-mask air purifying respirator equipped with high efficiency filtering cartridges/filters. Respiratory protection shall be worn by personnel collecting bulk samples of insulation.

b. Secure supply and exhaust ventilation systems in the area.

c. Lightly moisten the cut area with water using a plastic water spray bottle to control asbestos dust while cutting out bulk insulation samples. Adjust the spray to produce a mist, not a straight stream.

d. While cutting into the lagging, hold a disposable plastic bag under the area for collection of any debris.

e. Only a small sample is required for analysis. Carefully cut an approximate 1/2-inch (or quarter size) diameter core through the outer lagging cloth/paste and through the underlying insulation down to the covered metal surface. For soft insulation material, a knife may be appropriate. For hard preformed insulation, a chisel or sharpened screwdriver may be used. A knife is not safe for use with hard preformed insulation since the increased force necessary to penetrate the insulation makes accidental hand contact with the exposed blade a real probability. The ideal coring device is a sharpened steel punch that can be driven into the preformed insulation. Some Navy shipyards have locally fabricated stainless steel borers, modeled after cork borers but substantially strengthened, for this purpose. Whatever device is used for sampling must be cleaned after each sample to prevent cross-contamination of samples. For boring tools, cleaning with a wire bore-brush followed by a water wash is recommended. A sample should be submitted for every 10 feet of lagging provided that the material appears to be the same. If there are breaks, seams, or changes in the direction of the lagging, a sample for each section is required. A sample for each type of tile and type of gasket or packing should also be submitted.

f. Using forceps, a spatula, some other instrument or a gloved hand, place the insulation in a 4 by 4-inch polyethylene interlocking seal bag. Label the exterior of the bag as required in paragraph B0104b(3)(b). The bag shall be marked as to location of the sample, command, sampler's name, date of sample and any sample number, if applicable. Fold and place the labeled bag inside another 4 by 4-inch polyethylene interlocking seal bag.

Appendix B1-A

Enclosure (1)

g. After collecting the sample, cover the exposed insulation with duct tape, place respirator in a plastic bag. Respirators should be cleaned per chapter B6. Cartridges and all rags or material used to wipe down the respirator and/or tools should be immediately disposed of as asbestos waste per B0104d(2). Wash hands, tools and sprayer.

h. The collected sample(s) should be submitted by mail or hand-delivered using the Navy Environmental Health Center Industrial Hygiene sample submission form. This form is found in reference B1-5.

i. Upon receipt, the sample will be analyzed using polarizing light and dispersion staining microscopy, results recorded on the DD 1222 and returned to the requesting command. A return phone call of results may also be arranged.

**Appendix B1-B**

**STANDARD OPERATING PROCEDURES FOR SHIP'S FORCE PROTOCOL**

**Replacement of Asbestos-Containing Gasket/Packing Material**

1. **Scope**. This standard operating procedure covers the repair and/or replacement of asbestos-containing gaskets or packing in pumps or valves and the replacement of asbestos-containing gaskets in pipes.
2. **Stowage**. Store all quantities of asbestos-containing materials (ACM) in sealed impermeable containers and label as asbestos-containing material until needed for repair/replacement per B0104d(1). Similarly stow waste asbestos-containing materials for shore offload. Post storage areas with asbestos warning signs to advise personnel of asbestos presence per B0104b(3)(b).
3. **Personal Protective Equipment**. No personal protective equipment is required for this standard operating procedure.
4. **Procedures**

**NOTE:**

Do not consume food or beverages, chew gum or tobacco, smoke, or apply cosmetics during asbestos-containing gasket/packing maintenance operations.

- a. Use an impermeable drop cloth below the work area.
- b. Thoroughly wet the gasket or packing material with water prior to removing. For gaskets, wetting should be accomplished after the joint is loosened.
- c. Avoid cutting, abrading, or breaking the gasket or packing material. Remove the gasket or packing material intact, if possible.
- d. Place wet gasket or packing material into a disposal container and keep it wet until transferred to a closed receptacle.

**NOTE:**

A sealable, suitably sized plastic bag may be used for temporary stowage until transferred to an appropriately labeled container.

- e. Remove any residue by scraping using wet methods.

**NOTE:**

Do not use power tools to remove gasket or packing residue.

- f. Dispose of gasket or packing material and drop cloth as ACM.
- g. Replace all asbestos-containing materials with approved asbestos-free material, if available. If replacement material contains asbestos,

prior to cutting new gasket or packing, thoroughly wet gasket or packing material; then cut. Once cut gasket or packing is in place, dispose of residual debris, continuing to use wet methods. Wipe up debris with damp rags. Gasket or packing material that is still useable shall be placed in asbestos-labeled container/bag and properly secured.

**NOTE:**

Wire-wound (flexitallic) gaskets with asbestos between rings need not be wetted prior to installation.

h. At the conclusion of work, either use a cleaner with a high efficiency, particulate air (HEPA) filter to vacuum all dusty surfaces or wet and wipe them down with a damp rag. Dispose of damp rag(s) as ACM.

i. Clean and decontaminate all tools with damp rags. Dispose of rags as ACM.

j. Personnel shall wash their hands upon completion of gasket or packing repairs/replacements and before eating and drinking, chewing gum or tobacco, or applying cosmetics.

5. **Offload.** Offload the replaced gasket or packing material and any scrap materials as ACM. Handle all rags as asbestos waste. Handle drop cloths as ACM. Once asbestos waste is collected, place in red asbestos labeled bag and thoroughly wet all wastes. Tape off the bag and place in second approved and appropriately-labeled bag (double bag). Seal up the second bag with tape and place in ACM-marked barrel/container for offload. Seal all bags with a "J" or goose-neck seal. Properly label the waste bag per all local requirements.

6. **Medical Surveillance.** Medical surveillance is not required for this operation.

7. **Training.** All personnel performing replacement of asbestos-containing gasket/packing material shall be trained on this standard operating procedure prior to performing any asbestos work. Accomplish training per paragraph B0109 and appendix B1-E. Training shall be accomplished as follows:

**For ships with no Emergency Asbestos Response Team (EART) or Intermediate Maintenance Activity (IMA),** this training shall be accomplished by the safety officer or engineering officer as on-the-job training using the Standard Operating Procedures in this appendix.

**For ships with an EART,** this training shall be accomplished by the safety officer or engineer officer, or a member of the EART that has successfully completed "Shipboard Asbestos Response" (A-760-2166), or Asbestos Supervisor/Worker (A-493-0069) as on-the-job training using the SOPs in this appendix.

**For ships with an IMA,** this training shall be accomplished by the safety officer or engineering officer, or a member of the IMA that has successfully completed "Asbestos Supervisor/Worker", A-493-0069. This will be on-the-job training using the SOPs in this appendix.

This training shall be documented in the member's service record upon completion.

**Appendix B1-B**

**STANDARD OPERATING PROCEDURES FOR SHIP'S FORCE PROTOCOL**

**Limited Asbestos Floor Tile Removal**

1. **Scope.** This standard operating procedure (SOP) covers removal of a limited amount of asbestos-containing floor tile. Limited amount is defined as 9 square feet of tile (approximately nine tiles). The intent of this SOP is operational; not to improve the aesthetics of a space.
2. **Stowage.** Store all quantities of asbestos-containing materials (ACM) in sealed impermeable containers and label as asbestos-containing material until needed for repair/replacement (see B0104d(1)). Post storage areas with asbestos warning signs to advise personnel of the presence of asbestos per B0104b(3)(b).
3. **Personal Protective Equipment**
  - a. **Respiratory Protection.** No respiratory protective equipment is required for this standard operating procedure.
  - b. **Gloves.** Wear disposable gloves for this action. Surgical gloves are prohibited.
4. **Procedures**
  - a. Cordon off an area around the floor tile to be removed using rope or tape and appropriate signs.

**NOTE:**

- Do not consume food or beverages, chew gum or tobacco, smoke, or apply cosmetics in the work area during maintenance operations.
- b. Remove the floor tiles from the deck using a putty knife, spatula, or other manual, hand-operated tool. Do not use power tools to remove floor tiles or mastic. Heat guns may be used to remove tiles. Avoid breaking the tiles, if possible.
  - c. Place removed floor tiles into a suitably colored and marked container.
  - d. If mastic will be removed from the deck, remove by scraping using wet methods. Mastic remover may be required to remove all mastic. Ensure mastic remover is authorized by checking the Ships Hazardous Material List (SHML) or through written commanding officer authorization.
  - e. Offload tile and mastic as ACM.
  - f. Use non-asbestos-containing replacement tiles. If replacement tiles contain asbestos, dispose of tile residue and debris as ACM. Wipe up debris with damp rags. Tile material that is still useable shall be replaced in asbestos-labeled container/bag and properly secured (see B0104d(1)).



g. At the conclusion of work, either HEPA vacuum all dusty surfaces or wet and wipe them down with a damp rag. Dispose of damp rag(s) as ACM.

h. Remove gloves and dispose of as ACM.

i. Clean all tools and decontaminate with damp rags. Dispose of rags as ACM.

j. Personnel shall wash their hands upon completion of tile/mastic removal action and before eating and drinking, chewing gum or tobacco, or applying cosmetics.

5. **Offload.** Dispose of removed tile and mastic material and any scrap materials as ACM. Handle all rags, disposable clothing, and respirator cartridges as ACM. Once all asbestos waste is collected, place in an impermeable ACM-labeled bag and thoroughly wet waste. Tape off the bag and place in second approved and appropriately-labeled bag (double bag). Seal up the second bag with tape and place in ACM-marked barrel/container for offload. Seal all bags with a "J" or goose-neck seal. Properly label the waste bag per B0104b(3)(b).

6. **Medical Surveillance.** Medical surveillance is not required for this type of operation.

7. **Training.** All personnel performing replacement of limited amounts of asbestos-containing floor tile shall be trained on this standard operating procedure prior to performing the operation. Accomplish training as follows:

**For ships with no EART or IMA,** this training shall be accomplished by the safety officer or engineer officer as on-the-job training using the Standard Operating Procedures in this appendix.

**For ships with an EART,** this training shall be accomplished by the safety officer or engineer officer, or a member of the EART that has successfully completed "Shipboard Asbestos Response" (A-760-2166) or Asbestos Supervisor/Worker (A-493-0069), as on-the-job training using the SOPs in this appendix.

**For ships with an IMA,** this training shall be accomplished by the safety officer or engineering officer, or a member of the IMA that has successfully completed "Asbestos Supervisor/Worker", A-493-0069. This will be on-the-job training using the SOPs in this appendix.

This training shall be documented in the member's service record upon completion.

**Appendix B1-B**

**STANDARD OPERATING PROCEDURES FOR SHIP'S FORCE PROTOCOL**

**Preventive Maintenance on Brake Assemblies**

1. **Scope.** This standard operating procedure covers brake planned maintenance system (PMS) on anchor windlass, capstan, and weight handling equipment (hoist, cranes, conveyors, elevators, winches, chainfalls, and come-a-longs) in which brakes are made of asbestos-containing materials.

2. **Stowage.** Store all quantities of ACM in impermeable, sealed containers and label as ACM until needed for repair/replacement. Post storage areas with asbestos warning signs to advise personnel of the presence of asbestos.

3. **Personal Protective Equipment**

a. **Respiratory Protection.** Wear a half-mask air purifying respirator equipped with high efficiency filtering cartridges for this operation. Do not wear single-use disposable respirators. Ensure that the Respiratory Protection Manager (RPM) is fully involved in the selection and fit testing of all respirators.

**NOTE:**

The command shall train, fit test and ensure that all personnel have been medically cleared to wear a respirator before allowing any personnel to don a respirator.

b. Wear disposable impermeable coveralls (Tyvek® Type II or equivalent) for this action. Seal the coveralls at the wrists, ankles, and neck. Wear disposable gloves to handle asbestos brake assemblies and tape gloves at the wrists.

4. **Procedures**

a. Cordon off the area and hang appropriate signs identifying the asbestos hazard.

**NOTE:**

Do not consume food or beverages, chew gum or tobacco, smoke, or apply cosmetics in the work area during maintenance operations.

b. During brake maintenance activities, control access to the space in which maintenance is being performed. This may require posting a Sailor at each entrance/exit to the space.

c. Use an impermeable drop cloth in the work area to assist in clean-up.

d. Do not use any equipment or perform any operation that liberates fibers or creates dust, (e.g., dry sweeping or using an air hose in the work area).

e. Before commencing work, either wet the area in which the brake assembly is located or vacuum the area or both, whichever will be required to

eliminate asbestos fibers or dust in the area. Use a high efficiency particulate air (HEPA) filter vacuum to ensure the area is thoroughly clean and good housekeeping is maintained.

**CAUTION:**

Do not use low pressure air to blow dust out of the brake assembly area.

f. Commence preventive maintenance in brake assembly area including repair/replacement of asbestos-containing components. During maintenance, take care not to use power tools that may generate dust. If a power tool must be used, consult either the shipboard assistant safety officer (if aboard)/industrial hygiene officer for further guidance.

g. At the conclusion of work, either HEPA vacuum all dusty surfaces or wet and wipe them down with a damp rag. Dispose of damp rag(s) as ACM.

h. Place all clothing removed in the reverse order it was applied. Dispose of coveralls as ACM.

i. Remove respirator last. Treat cartridges as ACM. The respirator facepiece shall be decontaminated and returned to proper storage.

j. Ensure all tools are cleaned and decontaminated with damp rags. Dispose of rags as ACM.

k. Personnel shall wash their hands upon completion of maintenance action and before eating and drinking, chewing gum or tobacco, or applying cosmetics.

l. Upon completion of all work, the safety officer shall inspect and clear the area using appendix B3-H prior to allowing general access to the space.

5. **Offload.** Offload the old brake pads and any scrap materials as ACM. Handle all rags, disposable clothing, respirator cartridges, and drop cloths as asbestos waste. Once all asbestos waste is collected, place in impermeable, appropriately-labeled bag and wet thoroughly. Tape off the bag and place in second approved and appropriately labeled bag (double bag). Seal up the second bag with tape and place in ACM-marked barrel/container for offload. Seal all bags with a "J" or goose-neck seal. Properly label the waste bag.

6. **Medical Surveillance.** Medical surveillance may be required for this asbestos operation. Placement of personnel into the asbestos medical surveillance program (AMSP) is based on past history and/or current exposure or potential exposure to asbestos. Placement into the AMSP is dependent upon industrial hygiene sampling data, and the determination of the medical department representative (MDR).

7. **Training.** All personnel performing brake assembly preventive maintenance shall be trained on this standard operating procedure prior to performing the operation. Accomplish training as follows:

**For ships with no EART or IMA**, this training shall be accomplished by the safety officer or engineering officer as on-the-job training using the Standard Operating Procedures in this appendix.

**For ships with an EART**, this training shall be accomplished by the safety officer or engineer officer, or a member of the EART that has successfully completed "Shipboard Asbestos Response" (A-760-2166), or Asbestos Supervisor/Worker (A-493-0069), as on-the-job training using the SOPs in this appendix.

**For ships with an IMA**, this training shall be accomplished by the safety officer or engineering officer, or a member of the IMA that has successfully completed "Asbestos Supervisor/Worker", A-493-0069. This will be on-the-job training using the SOPs in this appendix.

This training shall be documented in the member's service record upon completion.

**Appendix B1-C**

**STANDARD OPERATING PROCEDURES FOR  
EMERGENCY ASBESTOS RESPONSE TEAM (EART) PROTOCOL**

**1. General**

This SOP covers the emergency repair of asbestos-containing lagging. The intent of this SOP is for emergency asbestos lagging repair work, and is not for general maintenance or normal repair of asbestos lagging which must be conducted by an Intermediate Maintenance Activity (IMA) or contractor personnel.

**2. Personal Protective Equipment**

a. **Respiratory Protection.** A half face piece, continuous flow supplied air respirator shall be used.

**NOTE:**

All personnel wearing respiratory protective equipment shall be trained, fit tested, and medically cleared before donning a respirator.

b. **Gloves.** Wear disposable gloves for this action. Surgical gloves are prohibited as an outer glove. Surgical or patient exam latex gloves may be worn as an inner glove during removal operations.

c. **Disposable Sacksuits.** Wear impermeable coveralls (e.g., Tyvek® or equivalent disposable sacksuits) with integral booties and hood.

d. **Boots.** Wear rubber slip-resistant booties over the Tyvek® booties.

e. **Tape.** Duct tape shall be applied to wrists, ankles, and around the respirator and hood opening. While other tapes may work, duct tape is recommended due to its superior adhesive properties.

**3. Procedures**

a. Obtain the commanding officer's permission to remove asbestos for emergency repair.

b. Brief the EART.

c. Secure or redirect ventilation as necessary.

d. Cordon off the area around the asbestos lagging to be removed using rope or tape and appropriate signs.

e. Suit up team in required PPE ensuring that all openings are taped shut.

**NOTE:**

Do not consume food or beverages, chew gum or tobacco, smoke, or apply cosmetics during asbestos emergency repairs.

f. Use an impermeable drop cloth (polyethylene) below the work area.

g. Glove bag procedure

(1) Place any tools, encapsulant, etc. into glove bag before beginning securing operations.

(2) Attach glove bag to area being worked. Be sure to securely close all seams on and around the glove bag with duct tape.

(3) The glove bag should be tested for leaks using smoke tubes. Smoke tubes used in respiratory fit test procedures are ideal for this function. If leaks are found, secure with additional duct tape.

(4) Ensure HEPA vacuum and amended water sprayer are attached to appropriate points on the glove bag and taped to prevent leaks. When using HEPA vacuum to obtain negative pressure in a glove bag, it will be extremely difficult to maintain a negative pressure and accomplish work simultaneously. It is recommended that negative pressure be used only upon the completion of the job, and when the glove bag is being removed from the repair site.

h. Thoroughly wet lagging with the amended water prior to and during the removal operation.

i. Remove the lagging as intact as possible.

j. Clean bare pipe and seal off exposed insulation using approved encapsulation methods.

k. Wash and wipe down inside of glove bag from top to bottom to remove potential fiber contamination.

l. Remove any recoverable tools by holding onto them and pulling them out. The glove should now be inside out. Twist the glove and seal with duct tape. Cut glove from glove bag with scissors or sharp knife, and hold for later decontamination.

m. Turn on HEPA vacuum and twist glove bag in the middle below the vacuum hose. Seal with duct tape and cut in two, cutting in the middle of the tape. Place this into an approved and appropriately labeled disposal bag.

n. Disconnect rest of glove bag and place into asbestos disposal bag.

o. Replace all asbestos-containing lagging with non-asbestos containing lagging.

p. Either HEPA vacuum and/or wet and wipe any dusty or potentially contaminated surfaces with a damp rag. Dispose of rags as ACM.

q. Clean and decontaminate all tools with damp rags. Dispose of rags as ACM.

r. Pick up drop cloth and dispose of as ACM.

s. Remove rubber booties and decontaminate with wet rags. Dispose of rags as ACM.

t. Remove the coveralls and dispose of as ACM. It is recommended that the arms be turned inside out, then roll the suit down the body, and pull the legs inside out. This keeps contamination on the suit and away from the body.

u. Remove gloves by turning them inside out, and dispose of as ACM.

v. Remove respirator and decontaminate using warm soapy water.

w. Personnel shall shower upon completion of asbestos removal action and before eating and drinking, chewing gum or applying cosmetics.

4. **Disposal.** Dispose of glove bag, PPE, any scrap materials, all rags, and drop cloths as ACM. Once ACM is collected, place in an impermeable bag and thoroughly wet all wastes. Tape off the bag and place in a second approved and appropriately labeled bag (double bag). Seal up the second bag with tape and place in asbestos waste barrel/container for offload. Seal all bags with a "J" or goose neck seal.

5. **Medical Surveillance.** Medical surveillance is required for the EART.

6. **Training.** Personnel designated to be on the EART shall be trained through the 2-day Shipboard Asbestos Response (A-760-2166) or Asbestos Supervisor/Worker (A-493-0069) offered through the Naval Occupational Safety and Health, and Environmental Training Center (NAVOSHENVTRACEN).

7. **Conflicts.** Application of asbestos-control requirements shall not be allowed to compromise the requirements for control of radioactive contamination in naval nuclear-powered ships as contained in NAVSEA 0389-LP-028-8000, Radiological Controls for Shipyards. Should conflicts be discovered, submit a proposed resolution to COMNAVSEASYS COM (SEA 08).

**Appendix B1-D**

**STANDARD OPERATING PROCEDURES FOR THE INTERMEDIATE MAINTENANCE ACTIVITY**  
**ASBESTOS WORK PROTOCOL**

This standard operating procedure (SOP) for the IMA is generated from the Asbestos Supervisor/Worker Course (CIN: A-493-0069).

**1. General**

This SOP covers large-scale repair and removal of Thermal System Insulation (TSI), surfacing Asbestos Containing Materials (ACM), or Presumed Asbestos Containing Materials (PACM) inside a negative pressure enclosure (NPE).

**2. Tools, Equipment and Materials**

**a. Personal Protective Equipment (PPE):**

- (1) Disposable impermeable coveralls (Tyvek® 1422A or equivalent), with integral head and foot coverings
- (2) Rubber outer gloves and inner cotton gloves
- (3) Cloth work coveralls may be worn under disposable coveralls during operations conducted in low temperatures
- (4) Non-slip rubber overshoes.
- (5) Respirator requirements shall be determined by the Respiratory Protection Manager (RPM). Minimum required respiratory protection shall consist of a half mask, negative pressure respirator equipped with HEPA (P100) cartridges.

**NOTE:**

The new OSHA Respiratory Protection Standard designates HEPA-equivalent cartridges as P100.

Detailed information regarding PPE required for this work is found in appendix B1-J.

b. **Ventilation.** HEPA filtered exhaust (local or general area) sufficient to place the NPE under at least - 0.02 inches of water (as measured on a magnehelic gauge) and at least four air changes per hour. The number of negative air machines required to meet this requirement is dependent upon the volume of the NPE.

**c. Tools and Equipment:**

- (1) Spray bottle and/or other dispensing devices with amended water
- (2) Smoke generator or smoke tubes for small enclosures, to test the integrity of the NPE
- (3) Asbestos warning signs
- (4) Asbestos labels



(5) Approved, HEPA filtered vacuum cleaners labeled "Asbestos Use Only"

(6) Impermeable asbestos waste bags at least 6 mil thick

(7) Duct tape or equivalent

(8) Varying amounts of 6-mil sheet poly material.

d. **Forms:**

(1) Asbestos Regulated Area Sign -In/Out Log

(2) Qualified persons training certificate

(3) Supervisors Certification of Cleanup Following Work

(4) Bridging encapsulant, if necessary.

**3. Prerequisite Tasks.** Prior to beginning the work covered by this SOP, consideration must be given to lockout/tagout requirements, confined space entry requirements and the provision of a safe work area.

a. Critical Watchstanders, personnel who must remain in the immediate area, due to watchstanding requirements, where asbestos repair or removal is being conducted, are required to wear the same PPE as those personnel performing the asbestos work. Prior to donning the PPE, personnel must be trained per B0121 and appendix B-G.

**NOTE:**

All personnel wearing respiratory protective equipment shall be trained, fit tested, and medically cleared before donning a respirator.

b. Secure all ventilation in the space. If ventilation cannot be secured, redirect it away from the NPE.

c. A minimum of Grade D breathing air is required when supplied air respirators are used.

**4. Employee Briefing.** Prior to beginning the work covered by this SOP, all personnel must be briefed on the following safety consideration:

a. Heat stress

b. Buddy System

**5. IMA Asbestos Removal Work Procedures**

a. **Obtain Background Samples.** An industrial hygienist, or other person qualified to perform asbestos sampling, shall take background air samples prior to starting set-up operations. If sample analysis is greater than 0.01 f/cc (fibers per cubic centimeter), then the space shall be isolated and placed under asbestos controls.

b. **Establish a Regulated Area.** (The regulated area does not need to be established until just prior to commencement of asbestos removal operations.).

(1) Isolate the work area by erecting a Negative Pressure Enclosure (NPE):

(a) Configure NPE in a manner to accommodate the material, equipment, and personnel needed for the removal project.

(b) Construct enclosure of 6-mil poly material.

(c) Lock out/tagout HVAC systems within the regulated area. Isolate HVAC systems and openings (duct, diffusers, etc.) within the regulated area by sealing with two layers of 6 mil poly or equivalent material. Cover other critical barriers with at least one (1) layer of 6 mil poly material.

(d) Lock out/tagout electrical systems within the NPE.

(e) Install all necessary services such as water, vacuum hose, negative air machine, staging, ventilation, breathing air, and exterior/interior lights. All electrical equipment used in the NPE shall be connected to a ground fault circuit interrupter (GFCI).

(f) Post the regulated area, the entrance to the vestibule and the entrances to the decon area/buffer zone with asbestos warning signs, as well as other areas of potential access.

(2) Post a copy of the qualified persons training certificate at the regulated area.

(3) The qualified person shall supervise the construction of the NPE. Additionally, the qualified person shall be present for the entire time the boundary is established, associated services are established, during operation of the NPE, and during cleanup and disestablishment of the regulated area.

(4) Wrap all equipment and any object that cannot be readily removed from the NPE (e.g., all HVAC systems) in two layers of 6-mil poly material. Pre-clean with wet methods.

(5) Establish the asbestos decontamination area:

(a) Construct decontamination area of poly material adjacent to and connected to the NPE.

(b) The decontamination area shall consist of an equipment room, shower area, and clean room.

**NOTE:**

Showers may be omitted if demonstrated not to be feasible. However, every effort should be taken to establish an alternate location for showers.

(c) Provide impermeable, labeled bags and containers in the equipment room for the containment and disposal of contaminated clothing and other equipment.

c. Asbestos work operations cannot begin until demonstrated negative pressure has been established.

(1) HEPA filtered exhaust ventilation (local or general area) sufficient to place the area under negative pressure of at least - 0.02 inches of water (as measured on a magnehelic gauge) shall be maintained.

(2) The NPE shall be kept under negative pressure throughout the period of its use.

(3) The NPE will be smoke tested prior to operations and at the beginning of each work shift to ensure negative pressure is sustained during work.

(4) Air movement shall be directed away from employees performing asbestos work within the enclosure, and toward a HEPA filtration or a collection device.

(5) Maintain air movement at a minimum of four air changes per hour.

d. Initiate the Hazardous Area Sign-In/Out Log and ensure that personnel sign in and out.

e. The IHO shall monitor the work operation upon completion of setting up the regulated area. General area air sampling shall be collected at the boundary of the regulated area. Personal air sampling is also required.

#### **6. Work Practices Within the Regulated Area**

a. Install a drop cloth on the floor of the enclosure under the material to be removed. Secure with duct tape or equivalent.

b. Wet all asbestos material with amended water during all phases of the removal process. Ensure that power tools are not used during the removal process.

c. Personnel should start removal operations close to the decontamination area, and work toward the source of exhaust ventilation.

d. The qualified person shall inspect the job site at least once per work shift.

e. Encapsulate any exposed asbestos material prior to removal of NPE.

#### **7. Regulated Area Disestablishment**

a. Remove gross contamination from wall coverings or remove the inner contaminated layer of poly material.

b. Remove gross contamination from equipment in the work area. This includes the negative air machine, scaffolding, ladders, extension cords, hoses, and other equipment inside the work area. This can be accomplished using a combination of HEPA vacuuming and wet methods.

c. Remove the top layer of 6-mil poly material used to cover the floor area after appropriate cleaning. Carefully fold it inward into compact bundles for bagging and disposal.

05 October 2000

d. Conduct a visual inspection of all surfaces and reclean if necessary. Flashlights and inspection mirrors are good for this process.

e. Perform a final wipe-down of equipment and remove from the work area.

f. HEPA vacuum any remaining hard-to-reach places such as crevices around doors and shelves.

g. Detach the poly material floor covering from the wall and carefully fold inward into a compact bundle for bagging and disposal.

h. After the floor is uncovered, clean corners and crevices with a HEPA vacuum.

i. Wet-wipe and/or vacuum the walls. Begin cleaning the areas farthest from the negative air machine, and work toward it using amended water to wet wipe all exposed surfaces.

j. Wet mop floors using amended water. Be sure to change water frequently.

k. The asbestos removal supervisor shall re-inspect the NPE to verify there is no visible asbestos debris present. If the area is clean, obtain supervisor's signature per appendix B1-H, Workplace Release Checklist.

l. Conduct final clearance monitoring prior to disestablishment of the NPE. Ensure the HEPA-filtered exhaust ventilation is operational during this process.

m. If samples pass final clearance, remove outer layer of poly material and all critical barriers, disconnect negative air machine(s), and allow for reoccupancy.

n. Clean up, decontaminate, and disassemble the decontamination unit.

o. Place all ACM, containment materials, scrap, debris, bags, containers, equipment which cannot be decontaminated, rags, and asbestos contaminated clothing into approved and appropriately labeled impermeable bags and "J" seal. Prior to placing in bag, wet the asbestos waste to reduce airborne concentrations. Prior to sealing the bags, evacuate all air from the disposal bag using a HEPA vacuum.

p. Upon receiving the sample results, complete appendix B1-H, Workplace Release Checklist. Forward this form along with the Hazardous Area Sign-In/Out Log to the Industrial Hygiene Officer.

## Appendix B1-E

### TRAINING REQUIREMENTS FOR SHIP'S FORCE PROTOCOL

Navy Personnel Training Requirement	Citation	Course Title/Training Required	Requirement	Formality	Resource for Training	Length of Training	Periodicity
All personnel performing non-friable asbestos work: <ul style="list-style-type: none"> <li>Limited asbestos-containing floor tile removal</li> <li>Asbestos-containing gasket replacement</li> <li>Asbestos-containing brake assembly maintenance</li> </ul>	B0104g	Asbestos removal procedures detailed in appendix B1-B	Mandatory	Informal	For ships with no EART or IMA (See NOTE <sup>1</sup> )  For ships with an EART (See NOTE <sup>2</sup> )  For ships with an IMA (See NOTE <sup>3</sup> )	TBD	On-the-job training
All personnel performing preventive maintenance on brake assemblies	Appendix B1-B, chapter B6	Respirator fit-testing, selection, and maintenance	Mandatory	Informal	RPM	TBD	Prior to donning a respirator, and annually thereafter

Detailed information regarding class schedules, quotas, etc. can be found on the NAVOSH ETC website at <http://www.norva.navy.mil/navosh>

**NOTE <sup>1</sup>** For ships with no Emergency Asbestos Response Team (EART) or Intermediate Maintenance Activity (IMA), this training shall be accomplished by the safety officer or engineering officer as on-the-job training using the Standard Operating Procedures in appendix B1-B.

**NOTE <sup>2</sup>** For ships with an EART, this training shall be accomplished by the safety officer or engineering officer, or a member of the EART that has successfully completed "Shipboard Asbestos Response" A-760-2166, or Asbestos Supervisor/Worker (A-493-0069) as on-the-job training using the Standard Operating Procedures in appendix B1-B.

**NOTE <sup>3</sup>** For ships with an Intermediate Maintenance Activity (IMA), this training shall be accomplished by the safety officer or engineer officer, or a member of the IMA that has successfully "Asbestos Supervisor/Worker", A-493-0069, as on-the-job training using the Standard Operating Procedures in appendix B1-B.

Appendix B1-F

TRAINING REQUIREMENT FOR ASBESTOS-RELATED WORK

Emergency Asbestos Response Team

Navy Personnel Training Requirement	Citation	Course Title/Training Required	Requirement	Formality	Resource for Training	Length of Training	Periodicity
EART Personnel performing glove bag asbestos removal	B0114	"Shipboard Asbestos Response" A-760-2166	Mandatory	Formal Classroom	NAVOSHENVTRACEN	2 days	Initially. No refresher required.
EART Personnel performing glove bag asbestos removal	Appendix B1-C chapter B6	Respirator fit-testing, selection, and maintenance	Mandatory	Informal	RPM	TBD	Prior to donning a respirator, and annually thereafter

Detailed information regarding class schedules, quotas, etc. can be found on the NAVOSH ETC website at <http://www.norva.navy.mil/navosh>

OPNAVINST 5100.19D  
05 October 2000

Appendix B1-F

Enclosure (1)

## Appendix B1-G

### TRAINING REQUIREMENT FOR ASBESTOS-RELATED WORK

#### Intermediate Maintenance Activity Personnel

Navy Personnel Training Requirement	Citation	Course Title/Training Required	Requirement	Formality	Resource for Training	Length of Training	Periodicity
Engineering/Repair IMA Personnel performing unlimited asbestos repair/removal	B0121a	Asbestos Supervisor/Worker A-493-0069	Mandatory	Classroom	NAVOSHENVTRACEN	5 days	Prior to performing any asbestos repair/removal operations.
Engineering/Repair IMA Personnel performing unlimited asbestos repair/removal	B0121a	Asbestos Supervisor/Worker Refresher, A-493-0070	Mandatory	Classroom	NAVOSHENVTRACEN	1 day	Annually (1 year from the successful completion of A-493-0069) for as long as personnel perform work under this protocol.
Engineering/Repair IMA Personnel performing unlimited asbestos repair/removal	Appendix B1-D, chapter B6	Respirator fit-testing, selection, and maintenance	Mandatory	Informal	RPM	TBD	Prior to donning a respirator, and annually thereafter
<b>Other Related Training</b>							
IHO	B0119a(4)	Analysis of Bulk ID Samples B-322-2334 or Equivalent	Mandatory	Classroom or Equivalent	EPMU or Equivalent	5 days	No refresher required. However, required to successfully participate in Proficiency Analytical Testing Program/RTI Program

Navy Personnel Training Requirement	Citation	Course Title/Training Required	Requirement	Formality	Resource for Training	Length of Training	Periodicity
IHO	B0119a(4)	Analysis of Airborne Asbestos Samples (B-322-2333) or 582 equivalent	Mandatory	Classroom or 582 equivalent	EPMU or Equivalent	5 days	No refresher required, However, required to successfully participate in Proficiency Analytical Testing Program

This training shall be documented in the service member's service record upon completion

Detailed information regarding class schedules, quotas, etc. can be found on the NAVOSH ETC website at <http://www.norva.navy.mil/navosh>



05 October 2000

**Appendix B1-H****WORKPLACE RELEASE CHECKLIST**

Upon completion of an asbestos repair or removal, use this checklist to inspect the asbestos work area. This inspection is a critical part of the asbestos removal operation. Failure to satisfactorily complete the inspection, which includes correction of all deficiencies observed, may result in asbestos exposure long after the project is completed. Complete this inspection prior to disestablishment of the asbestos work area. The department performing the asbestos work must retain a copy of the checklist with other records of the removal.

Provide the inspector with a standard flashlight equipped with fresh batteries, a complete set of personal protective equipment, including respirator (where applicable), required for entry into the asbestos work area. Do not begin the inspection until all surfaces within the regulated area are dry and visibly cleared of dust and debris to ensure that any contamination can be observed.

Inspector: \_\_\_\_\_ Last 4:  
(SSN) \_\_\_\_\_  
Asbestos  
Removal Team  
Supervisor: \_\_\_\_\_  
Date: \_\_\_\_\_ Time: \_\_\_\_\_  
Area  
Inspected: \_\_\_\_\_  
Ship's Name: \_\_\_\_\_ Hull No.: \_\_\_\_\_

		SAT	UNSAT
1	<b>All</b> surfaces within the regulated area are free of visible dust and debris. Use mirrors, flashlights, and other tools to accomplish this inspection. Inspect cable ways to the extent possible without disturbing the wires.		
2	Asbestos work area is still secured and properly posted.		
3	All asbestos waste is properly sealed in leak tight containers that are labeled with proper warning label (paragraph B0104b(3)(b)).		
4	All asbestos containing material that was to have been removed has been removed.		
5	Surfaces exposed by the asbestos removal operation are free of <b>all</b> visible contaminants, rust, and scale. If rust and scale are present and can not be removed they must be encapsulated. This inspection requires that the exposed surface be disturbed to see if there is any residue. This may be accomplished with a screw driver, scratch awl, or other pointed device.		
6	IMA protocol only - The project is considered complete if samples collected are no greater than 0.01 f/cc or background, whichever is greater, as measured prior to starting the non-emergency asbestos abatement, but never greater than 0.1 f/cc.		

OPNAVINST 5100.19D

05 October 2000

I certify that the inspection is satisfactory and the regulated area may be released from asbestos controls for unrestricted access.

Signature: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Signature Authority:

<b>IMA Protocol:</b>	Safety Officer or IHO signature required
<b>EART Protocol:</b>	Safety Officer signature required
<b>Ship's Force Protocol:</b>	Department Head or Division Officer

05 October 2000

## Appendix B1-I

PERSONAL PROTECTIVE AND SPECIAL EQUIPMENT

## Ship's Force Performing Non-Friable Asbestos Repair and Removal

Operation	Required Personal Protective Equipment				Special Equipment
	Hood	Respirator	Gloves	Tyvek® (or equivalent) Coveralls	HEPA Vacuum
Limited Floor Tile/Mastic Removal			√		optional
Brakes/Clutch Assemblies	√	√*	√	√	√
Replacement of Gaskets/Packing materials					optional

\* For work covered by this protocol, the worker will wear a half face, air-purifying respirator with high efficiency filtering cartridge. The RPM will determine the type of respirator required for each work process.

Type, quantity, specific ordering information for this PPE is found in appendix B1-J

Gloves: Use medium weight rubber gloves with a thin cotton "under glove" to absorb perspiration.

See appendix B1-J for Navy Stock Numbers (NSNs) for this and all associated PPE and equipment.

**NOTE:**

Critical watchstanders, personnel who must remain in the immediate area, due to watchstanding requirements, where asbestos repair or removal is being conducted, are required to wear the same PPE as those persons performing the asbestos work.

**Appendix B1-J**

**AUTHORIZED EQUIPPAGE LIST FOR ASBESTOS WORK PROTOCOLS**

**AEL 2-330024045**

<b>NOMENCLATURE</b>	<b>NSN</b>	<b>U/I</b>	<b>SHIP'S FORCE</b>	<b>EART</b>	<b>IMA</b>
Bag, Disposal Red Plastic 55 GAL Cap	8105-01-086-5053	BX	1	1	5
Cooling Assembly	4240-01-083-3399	KT	0	3	6
Ambient Air Breathing Apparatus, Electric	4310-01-106-4121	EA	0	0	2
Warning Signs	9905-01-345-4519	EA	OAR*	OAR*	OAR*
Coveralls, Disposable, sacksuit w/shoes and hood, Large	8415-01-092-7531	BX	0	1	2
Coveralls, Disposable, sacksuit w/shoes and hood, X-Large	8415-01-092-7532	BX	0	1	2
Glove Inserts, Surgeons	6515-01-354-3157	PG	10	20	100
Gloves, Clean Room, Medium		PG	10	20	100
Gloves, Clean Room, Large		PG	10	20	100
Overshoes, Rubber Medium	8430-00-421-7487	PR	0	6	18
Overshoes, Rubber Large	8430-00-421-7488	PR	0	6	18
Overshoes, Rubber X-Large	8430-00-421-7489	PR	0	6	18
Sprayer, Insecticide	3740-00-191-3677	EA	0	1	3
Spray Bottle, Plastic	8125-00-488-7952	EA	4	4	24
Duct Tape	5640-00-103-2254	RO	0	20	100
Plastic Sheeting, 6 mil	8135-00-579-6486	RO	0	2	10
Paper Towels, Absorbent	7920-00-823-9772	BX	1	2	5

OPNAVINST 5100.19D  
05 October 2000

Appendix B1-J

Enclosure (1)

NOMENCLATURE	NSN	U/I	SHIP'S FORCE	EART	IMA
Finger Grip Saw	5110-00-570-6896	EA	0	2	4
Keyhole Saw	5110-00-142-5010	EA	0	2	4
Nylon Brush	7920-00-324-2746	EA	0	2	4
Scouring Pad	7920-00-753-5242	EA	0	3	10
EAB Modification Kit for Submarines	4240-01-077-5994	EA	0	6	0
Ventilation Smoke Tube Kit (for glovebags)	MSA 458481	EA	0	1	2
Glass Smoke Tubes (10/PKG)	MSA 5645	PG	0	2	6
Negative Air Unit, Abatement Technologies, HEPA-Aire 1000, Part Number H1000V  Replacement Parts: H1001 Primary Filter Pads, 30/cs. H1002-12 Pleated Secondary Filters, 12/cs. H1010E Wood Frame 99.97% HEPA, 1/cs.	Open Purchase: Abatement Technologies 3305 Breckenridge Blvd. #118 Duluth, GA 30136 1-800-634-9091	EA	0	0	2
Magnehelic Gauge	6685-00-910-6964	EA	0	0	1
HEPA Vacuum: Hako Minuteman Wet/Dry, 15- gallon capacity; C83985-05/-16.  Replacement parts: *800317 Crush-proof Hose *800015 Wand (Operator's Handle) *800070 Gulper Tool *800024 Round Dust Brush *800116 Swivel Connector *110121PKG Impact Filters (12/Pkg.) *805037PKG Plastic Bags (12/Pkg.) *805038PKG Filter Protectors (12/Pkg.) 110010 HEPA Filter Replacement (85" Water Lift) Lid Assembly 110001 HEPA Filter Replacement (105"/130" Water Lift) Filter	GSA Contract Number: GS-07F-8158B	EA	0	0	1

Appendix B1-J

B1-J-2

Enclosure (1)

NOMENCLATURE	NSN	U/I	SHIP'S FORCE	EART	IMA
Replacement *Note: Items with an asterisk (*) are included as part of No. 800109, Wet/Dry Tool Kit 30B. <b>OR</b>					
HEPA Vacuum: Nilfisk VT60 Wet/Dry, 5 to 15-gallon capacity; *01799350/375101  Replacement Parts: *01722601 Impact Filter (washable) *017383 Main Filter Finger Tubes (washable) *616821 Microfilter *017840 Trolley Assembly *01727631 HEPA Cartridge *017196 10-foot Plastic Hose (1.5") *017193 Double-Curved Aluminum Wand *017192 14-inch Wheeled Floor Nozzle *0171941 3-inch Aluminum Dust Brush *017195 11-inch Plastic Crevice Nozzle *017191 Container Polyliners (25/Pkg.)  *Note: Items with an asterisk (*) are included as part of item number 01799350/375101.	GSA Contract Number: GS-07F-8356C	EA	0	0	1
HEPA Vacuum: Nilfisk GM80 HEPA-Filtered Vacuum System, 3-gallon capacity; *01790133/375102  Replacement Parts: *118274 Power Cord for Grounded Motor *115470 Detachable Trolley for GM80 Canister *01709600 Positive-Twist Safety Latches *120975 78-inch Tapered Plastic Hose with Curved Tube *111124 Straight Steel Wands	GSA Contract Number: GS-07F-8356C	EA	1	1	1

B1-J-3

Appendix B1-J

Enclosure (1)

NOMENCLATURE	NSN	U/I	SHIP'S FORCE	EART	IMA
*120410 Combination Floor Nozzle *11276901 3-inch Round Dust Brush *811409 6-inch Crevice Nozzle *320437 5-inch Upholstery Nozzle *816200 2-Ply Disposable Paper Bags (5/Pkg.) *616821 Microfilter *01710440 HEPA Filter Assembly *017190 Container Poly Liners (25/Pkg.) **01702425 Variable Speed Control  *Note: Items with an asterisk (*) are included as part of item number 01790133/375102. **Note: This item is optional, and is not included as part of item number 01790133/375102. However, it is recommended when performing glove bag operations.					

**NOTE:** See Appendices B1-I for PPE requirements for Ship's Force Protocol, B1-K for requirements for PPE requirements for Emergency Asbestos Response Team Protocol, and B1-M for PPE requirements for Intermediate Maintenance Activity Protocol.

\*OAR - Order As Required

05 October 2000

## Appendix B1-K

PERSONAL PROTECTIVE AND SPECIAL EQUIPMENT

Emergency Asbestos Response Team Performing Glove Bag ACM Removal

Operation	Required Personal Protective Equipment						Special Equipment			
	Tyvek® or Equivalent									
	Coveralls	Hood	Booties	Z-87 Safety Goggles	Respirator	Gloves	HEPA Vacuum	Cooling Assembly	Finger Grip Saw	Keyhole Saw
Glove Bag Procedures ONLY										
<3 linear feet of pipe insulation or 1 square foot of insulation on surfaces other than pipes	√	√**	√**	√	√*	√	√	√	√	√

\* The RPM will determine the type of respirator required for each work process. If the concentration of airborne asbestos is unknown, use a full-face, continuous flow supplied air respirator. The Self Contained Breathing Apparatus (SCBA) respirator meets this requirement.

\*\* Type II Tyvek® (or equivalent) coveralls have hood and booties attached, therefore, separate hoods and shoe coverings are not required with this PPE.

Type, quantity, specific ordering information (NSN information) is found in appendix B1-J. Information contained in appendix B1-J is taken from AEL 2-330024045.

Gloves: Use medium weight rubber gloves with a thin cotton "under glove" to absorb perspiration.

See appendix B1-J for the National Stock Numbers (NSNs) for this and all associated PPE and equipment.



05 October 2000

**Appendix B1-L**

**ASBESTOS REPAIR OR REMOVAL PREWORK BRIEF**

To be conducted jointly between the IMA and the vessel receiving asbestos repair or removal support.

Prior to conducting asbestos repair or removal operations on a ship, the IMA will conduct a pre-work briefing with the engineer officer, safety officer, division officer and/or workcenter supervisor of the department of the ship receiving the asbestos work.

The briefing will include at least the following:

1. A listing of all spaces that will be affected by the asbestos work. These will include the spaces used for shower facilities if they are required.
2. A discussion of the asbestos controls that will be used to accomplish the work. This will include:
  - a. The exact location of the asbestos regulated area boundaries
  - b. The requirement to secure ship's ventilation in the area of the removal operation and its effect on the ship and personnel
  - c. Disposal of any waste generated and who will be responsible for its disposal. Normally this will be the receiving ship
  - d. Air monitoring that will be accomplished and how the results of the general area monitoring will be conveyed to the receiving ship.
3. A discussion of any vital watchstanders the receiving ship may require to remain in the asbestos regulated area. The IMA and the receiving ship will mutually agree to the need for these watchstanders.
4. The planned times that the asbestos area will be isolated and entry restricted.
5. Any additional aspects of the planned work that either party feels should be discussed.

Appendix B1-L

Enclosure (1)

05 October 2000

## Appendix B1-M

PERSONAL PROTECTIVE AND SPECIAL EQUIPMENTIntermediate Maintenance Activity Performing Extensive Removal and Repair of  
ACM

Operation	Required Personal Protective Equipment						Special Equipment					
	Tyvek® or Equivalent											
	Coveralls	Hood	Booties	Z-87 Safety Goggles	Respirator	Gloves	HEPA Vacuum	Cooling Assembly	Finger Grip Saw	Keyhole Saw	Negative Air Unit	Magnehelic Gauge
Removal or repair of unlimited quantities of ACM	√	√**	√**	√	√*	√	√	√	√	√	√	√

\* The RPM will determine the type of respirator required for each work process. If the concentration of airborne asbestos is unknown, use a full-face, continuous flow supplied air respirator. The Self Contained Breathing Apparatus (SCBA) respirator meets this requirement.

\*\* Type II Tyvek® (or equivalent) coveralls have hood and booties attached, therefore, separate hoods and shoe coverings are not required with this PPE.

Type, quantity, specific ordering information is found in appendix B1-J. Information contained in appendix B1-J is taken from AEL 2-330024045.

See appendix B1-J for the National Stock Numbers (NSNs) for this and all associated PPE and equipment.

Gloves: Use medium weight rubber gloves with a thin cotton "under glove" to absorb perspiration.

**NOTE:**

The proper use of protective clothing requires that all openings be closed and that garments fit snugly about the neck, wrists, and

Appendix B1-M

Enclosure (1)

OPNAVINST 5100.19D  
05 October 2000

ankles. Accordingly, tape the wrist and ankle junctions, as well as the collar opening on the outer disposable coveralls to prevent contamination of skin and underclothing without restricting physical movement.

**NOTE:**

Critical watchstanders, personnel who must remain in the immediate area, due to watchstanding requirements, where asbestos repair or removal is being conducted, are required to wear the same PPE as those personnel performing the asbestos work, and at least a half-mask, air purifying respirator with a high efficiency filtering cartridge.

**FOR SUBMARINES**

Personnel performing asbestos work shall wear an emergency air breathing (system) (EAB) modified to replace the demand regulator (see AELs 2-330023-47, 2-33034070, and 2-330024045 for EAB kit information). Watchstanders in the same compartment as the work being performed may wear an unmodified EAB mask.

## CHAPTER B2

### HEAT STRESS

#### BO201. DISCUSSION

a. Heat stress is any combination of air temperature, thermal radiation, humidity, airflow, and workload that may stress the body as it attempts to regulate body temperature. Ships can determine maximum exposure limits for various environmental conditions and individual work rates. Adherence to these maximal heat exposure guidelines can prevent or reduce the adverse physiological effects of heat stress. Additionally, sufficient recovery time in a cool environment will help reverse the harmful effects of heat stress. Heat stress becomes excessive when the body is unable to offset the buildup of internal body heat due to exercise, work activity or environmental conditions. Body temperature will increase if this internal heat buildup cannot be transferred out of the body. This condition can produce fatigue, rash, cramps (particularly in the extremities and abdomen), profuse sweating, dehydration, tingling in the extremities, pallor, rapid heartbeat, severe headache, nausea, vomiting, and poor physical and mental performance in affected personnel. As body temperature continues to rise (due to prolonged exposure), heat injuries (e.g., heat exhaustion or heat stroke) may occur resulting in severe impairment of the body's temperature regulating ability and possible death. Recognizing personnel heat-stress symptoms and obtaining prompt medical attention for affected persons is an all hands responsibility. (R)

b. To obtain accurate and reliable data on heat-stress conditions, ships shall conduct heat-stress surveys to record dry-bulb (DB), wet-bulb (WB), and globe temperature (GT) readings. They must take DB and WB temperature with both thermometers shielded from radiant heat and the WB must also be properly ventilated to determine the effects of airflow. Measurement is accomplished by means of a globe thermometer that provides a value representing radiant and convection heat transfers to or from the body. The Navy uses either a wet-bulb-globe temperature (WBGT) meter or an automated heat stress system (AHSS) to measure each of the above temperatures. Ships use dry bulb, wet-bulb, and globe temperature readings to calculate a single number, the WBGT index. They use the WBGT index, along with the individual's physical exertion level to calculate an individual's permissible heat exposure limit. Appendix B2-A presents this information in a columnar format by means of the Physiological Heat Exposure Limits (PHEL) tables. (R)

c. While heat-stress conditions can occur in practically any space or area on board a ship, machinery spaces, laundries, sculleries, galleys, incinerator rooms, flight decks, and steam catapult rooms are the most likely to have the conditions that may cause heat stress. Causes of heat-stress conditions include operations in hot and humid climates, arduous physical tasks, steam and water leaks, boiler air casing leaks, missing or deteriorated thermal insulation, and ventilation system deficiencies.

In addition, other factors that reduce physical stamina and enhance susceptibility to heat-stress illness are dehydration, lack of sleep, illness, use of medication, drugs, alcohol, and the presence of atmospheric contaminants such as combustion gases or fuel vapors.

d. Heat Acclimatization. In most individuals, appropriate repeated exposure to heat stress causes a series of physiologic adaptations called acclimatization, whereby the body becomes more efficient in coping with the heat stress. An acclimatized individual can tolerate a greater heat stress before harmful level of heat strain occurs. Personnel acquire heat acclimatization only gradually, being fully achieved over a 3-to-4-week level of sustained physical activity. Therefore, unacclimated individuals may increase their risk of incurring acute adverse health effects from exposure to harmful levels of heat stress.

e. This chapter establishes Navy policy and procedures for the control of personnel exposure to heat stress and applies to all ships, including submarines. Ships shall not expose personnel to excessive heat stress and shall provide a shipboard work environment that minimizes the probability of such exposure.

f. This chapter applies to heat-stress control and personnel protection for most shipboard operating conditions. It does not apply for the determination of heat exposure limits specifically for personnel wearing layered or impermeable clothing such as chemical/biological warfare clothing, fire fighting protective clothing or ensemble, or chemical protective clothing (worn for use during clean-up of hazardous material spills) or any type of body cooling garment or device.

**B0202. RESPONSIBILITIES**

**a. The commanding officer shall:**

(1) Establish and enforce an effective heat-stress policy that ensures personnel heat exposures are limited per this chapter except in an operational emergency.

(2) Review and initial daily, heat-stress surveys that result in reduced stay times.

(3) Conduct an inquiry into the circumstances surrounding all heat injuries that result in unconsciousness as prescribed in reference B2-1.

(4) Report to the immediate superior in command (ISIC) those material deficiencies, beyond ship's force capability to correct, which contribute to heat-stress conditions aboard the ship.

(5) Report heat-stress related cases as specified in paragraph B0204f.

R) (6) For ships without an Automated Heat Stress System installed, ensure at least two calibrated, working WBGT meters are stowed onboard.

**b. The medical department representative (MDR) shall:**

R) (1) If an Automated Heat Stress System (AHSS) is installed, maintain and calibrate at least one portable WBGT meter in the event that the automated system should fail.

(2) Review all engineering and non-engineering heat-stress surveys to determine obvious inaccuracies, reduced PHEL stay times, and any personnel protective actions being taken. Submit heat-stress surveys that result in reduced stay times to the commanding officer daily for review.

(3) Provide training to divisions on heat-stress health hazards, symptoms, prevention, and first aid procedures, upon request.

(4) Prepare reports of heat-stress related cases as specified in paragraph B0204f.

(5) **For submarines**, the MDR conducts heat-stress surveys in engineering spaces.

**c. The engineer officer/reactor officer shall:**

(1) Ensure dry-bulb thermometers are installed per paragraph B0204b(1) and temperatures are monitored and recorded per paragraph B0204b(3) and (4).

(2) Assign and qualify engineering department personnel to perform heat-stress surveys in engineering spaces.

(3) If an Automated Heat Stress System (AHSS) is installed, maintain and calibrate at least one portable meter in the event that the automated system should fail. (R)

(4) Review heat-stress surveys and ensure stay times for engineering/reactor personnel are being properly determined as specified in paragraph B0205. Limit personnel heat exposures accordingly, except as approved by the commanding officer in an operational emergency.

(5) Record all heat-stress related deficiencies on Current Ship's Maintenance Project (CSMP). Appendix B2-B provides heat-stress trouble-shooting and recommended repair actions.

d. **The supply officer, air boss, and other department heads shall:**

(1) Ensure dry-bulb thermometers are installed per paragraph B0204b(1) and temperatures are monitored and recorded per paragraph B0204b(3) and (4).

(2) May assign and qualify departmental personnel to conduct heat stress surveys of departmental spaces. Qualification of personnel shall be trained as specified in paragraph B0206.b.

(3) Ensure the heat stress surveyor conducts heat-stress surveys per B0204(4) and B0204(5).

(4) Review heat-stress surveys and ensure stay times for personnel are being properly determined as specified in paragraph B0205. Limit personnel heat exposures accordingly, except as approved by the commanding officer in an operational emergency.

(5) Record all heat-stress related deficiencies on CSMP. Appendix B2-B provides heat-stress trouble-shooting and recommended repair actions.

e. **Division officers shall:**

(1) Limit personnel heat exposures per established stay times, except as approved by the commanding officer in an operational emergency.

(2) Record all heat-stress related deficiencies on Current Ship's Maintenance Project (CSMP) for their respective division.

f. **Heat-stress surveyors shall:**

(1) Be qualified per paragraph B0206b

(2) Perform heat stress surveys as required by paragraph B0204.

g. **All hands shall:**

(1) Obtain prompt medical attention for personnel who exhibit heat-stress symptoms.

(2) Follow recommended work practices and procedures for controlling heat-stress hazards.

**B0203. HEAT-STRESS ELEMENTS**

- a. Monitoring and surveying of heat-stress conditions. (Paragraph B0204).
- b. Establishing safe work schedules in heat-stress environments. (Paragraph B0205).
- c. Investigating and reporting personnel heat injuries. (Paragraph B0204f and chapter A6).
- d. Training. (Paragraph B0206).
- e. Recordkeeping.

**B0204. HEAT-STRESS MONITORING AND SURVEYING**

a. **Definitions:**

(1) **Monitoring.** Observing and recording temperatures of DB thermometers at specified watch and/or workstations.

- R) (2) **Surveys.** Use of a WBGT meter or AHSS to measure DB, WB, and GT, and compute the WBGT index to determine the amount of time it is safe to work in a given space. Personnel conducting a survey can validate the WBGT index using the following formula:

$$\text{WBGT} = (0.1 \times \text{DB}) + (0.7 \times \text{WB}) + (0.2 \times \text{GT}).$$

(3) **Heat-stress Surveyor.** A trained person assigned to conduct required surveys.

b. **Heat-stress Monitoring:**

(1) **Dry-Bulb Thermometer Positioning.** A hanging DB thermometer (alcohol in glass - NSN 9G-6685-00-243-9964) shall be permanently mounted at watch and workstations throughout the ship where heat-stress conditions may exist. A DB thermometer shall also be mounted in non-air conditioned spaces, not normally manned, in which personnel may have to periodically work or conduct maintenance, such as storerooms. These thermometers shall be mounted in a position so they indicate the most accurate representative temperature for the area where workers/watchstanders spend the majority of their time. Placement of the DB thermometers may be in or out of the ventilation air stream but must be hung at least 2 feet from any supply ventilation terminal/opening. The temperature being measured must be representative of the heat-stress environment workers/watchstanders experience. Thermometers shall be hung with a non-heat conducting material such as plastic or string (never hang with metal wire) and positioned to minimize the influence of any adjacent or local heat or cold sources (avoid direct contact between thermometer and hot/cold structural surfaces). If the difference between the hanging DB thermometer and the DB temperature measured with the WBGT meter, during a survey, is 5°F or greater at any watch or workstation, then the DB thermometer is not representative of the temperature at the workstation. The hanging DB must be relocated, replaced, or validated by aligning the etch mark with the freezing point (32°F). A DB thermometer shall be temporarily mounted to monitor conditions where repairs or maintenance are being performed in a heat-stress area. The ship shall install DB thermometers, at a minimum, in main machinery spaces, (firerooms and enginerooms), auxiliary machinery spaces, emergency diesel spaces and other engineering spaces containing heat sources, as well as

in laundries, dry cleaning plants, sculleries, galleys, bake shops, and steam catapult spaces.

**NOTE:**

"No Calibration Required" (NCR) stickers are not required to be placed on DB thermometers.

(2) **Automated Monitoring System.** The AHSS units shall be mounted in a position so they indicate the most accurate representative temperature for the area where workers/watchstanders spend the majority of their time. The AHSS units shall be positioned so as to avoid interference with space activity. If ventilation is present at the workstation where an AHSS unit will be installed, then the sensor should be located in relation to the ventilation duct such that airflow to the sensor does not exceed 600 fpm. (R)

(3) **Dry-Bulb Temperature Readings.** The ship shall record DB temperature readings when the ship is underway or when potential heat-stress conditions exist while in port. The ship shall monitor the following compartments when manned: main machinery spaces, (firerooms and engine rooms), auxiliary machinery spaces, emergency diesel spaces, laundry spaces, sculleries, galleys, bake shops, and steam catapult spaces. Assigned personnel shall monitor compartments as follows:

(a) Every 4 hours for manned spaces if DB temperatures do not exceed 85° F

(b) Every hour for manned spaces if DB temperatures exceed 85° F

(c) Every hour at temporary installations where the DB temperature exceeds 85° during repair or maintenance operations.

(4) **Dry-Bulb Temperature Recording**

(a) Hanging DB temperatures shall be recorded on a prepared paper log form and reviewed by the space supervisor (e.g. machinist mate of the watch (MMOW), galley captain). If a DB temperature exceeds the temperature per paragraph B0204c(4)(a), the space supervisor shall circle (in red) the DB reading and immediately notify the watch supervisor (i.e. engineering officer of-the-watch (EOOW), division officer, etc). The watch supervisor shall direct heat-stress surveys to be conducted and enforce the resulting stay times. (R)

(b) The space supervisor (e.g. MMOW, galley captain) shall record and review the DB temperatures for the automated system either as part of the centralized data acquisition system, or as printed copies. The space supervisor shall initial in the appropriate box and check the appropriate notation in the computer log. If a DB temperature exceeds the temperature per paragraph B0204c(4)(a), the space supervisor shall immediately notify the watch supervisor (e.g. engineering officer of-the-watch (EOOW), division officer). The watch supervisor shall direct heat-stress surveys to be conducted and enforce the resulting stay times.

**c. Heat-stress Surveys - WBGT Meter**

(1) The heat-stress surveyor determines environmental heat-stress conditions using the WBGT meter (Model RSS 220, NSN 7G-6685-01-055-5298 or Heat-Stress Monitor - Model 960, NSN 3H-6665-01-333-2590), or the AHSS which provides a computer display, hard drive storage and printout of the heat stress information. Each method measures dry-bulb, wet-bulb, and globe temperature and integrates them into a single heat-stress value, the WBGT index. Appendix B2-C, Use of the WBGT Meter, provides detailed information and procedures regarding (R)



the proper use and care of the WBGT meter. The surveyor uses the WBGT index, along with the individual's physical exertion level, to determine the permissible heat exposure limits referred to as the Physiological Heat Exposure Limits or PHEL stay times.

**NOTE:**

- R) The operating range for the RSS-220 and Vista Model 960 WBGT meters is 65°F to 150°F. Use of these meters outside of this range will not provide accurate temperature measurements.

**(2) Measurement Techniques**

(a) When surveying a work or watch station using the WBGT meter, the surveyor shall position the meter where the worker/watchstander would normally stand or where the intended work is to be performed, with ventilation arranged to provide normal ventilation at that location. For specific operating instructions, see appendix B2-C paragraph 3.

(b) The heat-stress surveyor shall conduct the first WBGT measurement in the workspace after the meter has been in the space 5 minutes to enable it to equilibrate to the surrounding area. The heat-stress surveyor will wait 3 minutes at each subsequent watch or workstation to allow the meter to equilibrate before taking the reading.

(c) Where automated WBGT sensors are used, watchstanders should take care not to shield the automated WBGT sensor from airflow or heat sources so that readings reflect an accurate watchstander stay time.

**(3) Recording and Reporting Survey Results:**

(a) The heat-stress surveyor shall record all non-automated survey readings to the nearest 0.1°F on a Heat-Stress Survey Sheet similar to the ones found in appendix B2-D. The surveyor shall use the WBGT index reading to determine the PHEL stay time per section B0205. The surveyor shall record the PHEL curve used and the corresponding exposure time on the survey sheet. Upon completion of the survey and determination of PHEL stay times, the heat-stress surveyor shall note any stay times for manned watch or workstations that, under routine conditions, are less than the watch or work period. The surveyor shall circle these readings on the sheet in red. The surveyor shall notify space supervisors and responsible department heads immediately of the reduced exposure times. If a survey results in a PHEL stay time which is less than the work or watch period, the department head responsible for the space shall promptly notify the commanding officer of the condition, indicating action being taken to protect personnel and/or to reduce the excessive heat-stress situation.

(b) The heat-stress surveyor shall print all automated survey readings on a pre-formatted Heat-Stress Survey Sheet. The surveyor shall circle in red, on the Heat-Stress Survey Sheet, any PHEL stay times for manned watch or workstations that, under routine conditions, are less than the watch or work period. The heat-stress surveyor shall notify workspace supervisors and responsible department heads immediately of the reduced exposure times. The department head shall promptly notify the commanding officer of the condition, indicating personnel protective action being taken, and action, if any, to reduce the excessive heat-stress situation.

- R) (c) Ships shall use a Heat-Stress Survey Sheet in a format similar to the one found in appendix B2-D to record heat-stress information. Ships using a database or the AHSS may use a computer printout for the Heat-Stress Survey Sheet. The surveyor shall record the following heat-stress information on the Heat-Stress Survey Sheet manual or computer printout.

1. Date and time of survey
2. In the follow-on survey form identify a time and temperature.
3. Stations surveyed, including the following information for each station:
  - a. Time WBGT measurement was taken at the location
  - b. Hanging DB temperature. Not required for the automated system
  - c. WBGT meter readings for DB, WB, GT and WBGT
  - d. PHEL curve for the station and the corresponding exposure time.

**NOTE:**

Only the column that pertains to the current watch/work situation needs to be completed (e.g. all four columns do not need to be filled in).

4. WBGT Validation. The heat-stress surveyor shall manually calculate the highest WBGT index obtained using the formula:

$$\text{WBGT} = (0.1 \times \text{DB}) + (0.7 \times \text{WB}) + (0.2 \times \text{GT})$$

The surveyor shall compare calculated WBGT to the meter WBGT and the two readings shall be within 0.2°F. A manual calculation of the WBGT value is not required with the AHSS. (R)

(d) The heat-stress surveyor shall note any material deficiencies that may be contributing to adverse heat-stress conditions and record them on the survey sheet. Additionally, personnel shall comment on the availability of drinking water on the survey sheet.

(e) The surveyor shall record the hanging DB temperatures on the Heat-Stress Survey Sheet. If the difference between the hanging DB thermometer and the DB temperature measured with the WBGT meter, during a survey, is 5°F or greater at any watch or workstation, the DB thermometer is not representative of the temperature at the workstation. Relocate, replace or validate the hanging DB by aligning the etch mark with the freezing point (32°F). Comparing the hanging DB temperature values with the AHSS DB values is not required. (R)

(f) Following the department head's review, all Heat-Stress Survey Sheets, including engineering, shall be delivered to the MDR. The MDR shall review all engineering and non-engineering heat-stress surveys to determine obvious inaccuracies, reduced PHEL stay times, and any personnel protective actions being taken and submit Heat-Stress Survey Sheets daily to the commanding officer. The commanding officer shall initial the survey sheets, and return the sheets to the appropriate department.

(4) Space Surveys. Ships shall conduct the survey of spaces for heat stress using the WBGT meter or the AHSS: (R)

(a) At all manned watch/workstations within the space whenever the temperature from a permanently mounted hanging DB thermometer reaches or exceeds the following temperature requirements:

PHEL I through III

Watch/Work length 4 hours or less	DB => 100°F
Watch/Work length greater than 4 hours	DB => 90°F
PHEL IV through VI	DB = 85°F.

**NOTES:**

1. Daily WBGT Space Surveys at the hottest time of the day are no longer required.

2. Shipboard conditions cannot be adequately addressed by a single dry bulb value. For watches longer than 4 hours or activity levels greater than PHEL III, a 100°F temperature would miss potentially serious heat-stress conditions. The values listed above take into consideration likely levels of relative humidity, watch duration's, and levels of activity. Under normal operations, routine watches in engineering spaces are expected to be 4 hours at a PHEL III or lower. PHEL IV through VI apply to above average work rates.

(b) In any space when a heat injury (heat exhaustion or heat stroke) occurs.

(c) Prior to conducting Engineering Casualty Control (ECC) drills:

1. If the drill-set exceeds 3 hours (not required in spaces not affected by the drill or in areas that are unmanned)

2. If already in a reduced stay time, the surveyor shall use the most current heat-stress survey and calculate stay times for ECC watchstanders using the ECC PHEL values in appendix B2-A.

The length of the exercises cannot exceed the watch PHEL stay times.

**NOTE:**

Not applicable to submarines, which have air-conditioned engineering spaces.

(d) In any space when the commanding officer determines that a heat-stress situation may occur.

(e) As required for follow-on surveys (see paragraph B0204.c(5)).

(5) **Follow-on Surveys.** Ships shall accomplish follow-on surveys, of heat-stress spaces, using the WBGT meter as follows:

(a) For engineering spaces on nuclear, gas turbine and diesel powered ships

1. If the survey resulted in a PHEL stay time greater than the duration of the normal watch or work period and did not require a change from the normal watch/work time. No further follow-on surveys are required unless the hanging DB temperature increases by more than 5°F from the hanging dry bulb temperature in the previous survey.

2. If the survey resulted in a PHEL stay time less than the duration of the manned watch or workstation then the watch/work times shall be adjusted to reflect the new PHEL stay times indicated by the WBGT. A follow-on survey is only required if the DB temperature increases by 5°F or more from the hanging DB temperature in the previous survey. If the hanging DB temperature drops below the value in paragraph B0204c(4) and return to a normal watch/work time is desired, a survey shall be conducted to ensure conditions allowing a return to normal watch/work periods have been reestablished.

(b) Two options are provided for follow-on surveys for engineering spaces on non-nuclear, steam-powered ships and for laundries, sculleries, galleys, steam catapult spaces and arresting gear spaces.

1. Follow-on surveys where WB and DB temperatures are not monitored and recorded each hour. Follow-on surveys shall be conducted prior to the end of the current manned watch or work period as indicated in the previous survey. Follow-on surveys shall continue to be conducted each watch/work period until the conditions specified in paragraph B0204c(4) no longer exist.

2. Follow-on surveys where WB and DB temperatures are monitored and recorded each hour at manned workstations.

a. If the WBGT survey resulted in a PHEL stay time greater than the duration of the normal watch or work period, a change from the normal watch/work time is not required. Follow-on surveys are not required unless the DB temperature increases by 5°F or more and/or WB temperature increases by 3°F or more from the DB and WB temperatures recorded from the previous survey. The DB and WB temperature must be measured each time using the same instrument/device. The WBGT meter, motorized psychrometer, or commercially available hygrometer may be used to measure DB and WB temperature. If the DB temperature drops below the value in paragraph B0204c(4) and return to a normal watch/work time is desired, then a survey shall be conducted to ensure conditions allowing a return to normal watch/work periods have been reestablished.

b. If the WBGT survey resulted in a PHEL stay time less than the duration of the manned watch, or work period, the watch/work time shall be adjusted to reflect the new stay times indicated by the WBGT. Follow-on surveys are not required unless the DB temperature increases by 5°F or more and/or WB temperature increases by 3°F or more from the DB and WB temperatures recorded from the previous survey. The DB and WB temperature must be measured each time using the same instrument/device. The WBGT meter, motorized psychrometer, or commercially available hygrometer may be used to measure DB and WB temperature. If the DB temperature drops below the value in paragraph B0204c(4) and return to a normal watch/work time is desired, then a survey shall be conducted to ensure conditions allowing a return to normal watch/work periods have been reestablished.

**NOTE:**

The department head may elect to have more than one stay time rotation in a workspace. This would allow the majority of personnel to take advantage of a longer stay time instead of limiting all personnel to the most restrictive stay time. If more than one watch time rotation is implemented for a space it shall be indicated on the Heat-Stress Survey Sheet.

For example: A steam-powered ship in the Indian Ocean has obtained the following readings from an auxiliary space during the latest heat-stress survey conducted at 1400:

Top Watch	WBGT = 92	PHEL = II,	Stay time = 4:10
Evap Watch	WBGT = 93	PHEL = II,	Stay time = 3:50
Air Comp Watch	WBGT = 92	PHEL = II,	Stay time = 4:10
SSTG Watch	WBGT = 92	PHEL = II,	Stay time = 4:10
Messenger	WBGT = 92	PHEL = III,	Stay time = 3:30

The engineer officer assigns a 3 X 6 watch (3 hours watch in the space and 6 hours outside the space) for the evap watch and the messenger. The engineer officer assigns everyone else in the space to a 4 X 8 watch (4 hours watch in the space and 8 hours outside the space). The time outside the space must be in a cooler environment.

(c) **ECC**. A heat-stress survey to restore the normal watch is not required at the end of the ECC drill set unless a DB temperature at any manned watch station exceeds the appropriate value identified in paragraph B0204c(4)(a).

Appendix B2-E provides heat-stress survey decision diagrams that outline heat-stress survey and follow-on requirements.

(6) **Time Weighted Mean (TWM) WBGT Values**. The TWM WBGT is for use in especially hot environments where reduced stay times have been imposed on watch/work standers. The TWM WBGT is an optional, not mandatory provision, for use if an air-conditioned booth or cooler space is available for personnel to spend time in the cool climate and afford them some relief from the heat in the space. When implemented, the TWM changes the WBGT value for that individual and increases the length of time they can now spend at their watch/work station. Appendix B2-F provides ships that have this ability with a way of properly calculating the new WBGT value.

d. **Recovery Time For Personnel Reaching Exposure Limits**

(1) Supervisors shall direct personnel standing watch or working in spaces in reduced stay times (except in operational emergencies) to leave the heat-stress environment prior to the expiration of the PHEL stay time. These personnel shall move to a cool, dry area conducive to rapid physiological recovery (an area with an optimum DB temperature of less than or equal to 80°F).

(2) Preferred recovery environments are those that are air conditioned within the standards of reference B2-2. Provided there is no evidence of accumulated fatigue, the length of recovery time shall be equal to twice the exposure time or 4 hours whichever is less. After completing the necessary recovery period in preferred environmental conditions, an individual who nonetheless remains tired, unable to carry out normal work requirements, or has an increased incidence of health disorders shall be referred to the MDR for evaluation.

(3) Supervisors shall direct personnel experiencing heat-stress symptoms while standing watch or working in the workspace, to report immediately to the MDR for evaluation.

e. **Recommendations for Working in Heat-stress Environments**

(1) Drink more water than satisfies thirst. Do not wait until you are thirsty to start drinking (scuttlebutts must be readily available and in working order). It is important that personnel stay hydrated. A device that has proved very effective in helping personnel to stay hydrated on flight decks, steam catapult spaces, engineering spaces, laundry and in other hot locations on ship is the Camelbak® (or equivalent) drinking system. It holds 1.8 liters of water and is worn like a backpack with a straw mechanism that allows the

person to drink anytime or anywhere. The Camelbak® has proved very effective in helping to keep personnel hydrated especially in areas such as the Persian Gulf. It is available in the stock system under NSN 9Q-8465-01-396-9855.

(2) Eat three well-balanced meals daily.

(3) Get adequate rest. At least 6 hours of continuous sleep per 24 hours is recommended.

(4) Except where fire retardant or fire-fighting clothing is required, wear clean clothing composed of at least 35 percent cotton (more natural fiber content allows more effective evaporation of water from clothing).

(5) Do not take salt tablets.

(6) Limit intake of caffeinated drinks.

(8) The fleet has used several cooling vests in the stock system in a limited capacity. Initial research on one of these vests shows that if properly used in a heat-stress environment it can reduce thermal strain. However, when using cooling vests, personnel shall adhere to PHEL stay times as described in this chapter until revised PHEL curves are established for the cooling vest.

**NOTE:**

The use of using cooling vests that contain paraffin-based phase change material is not recommended. This material may be flammable and must be stored per the requirements for flammable material in chapter C23.

**f. Reports and Forms**

(1) Personnel exposed to excessive heat stress may require the professional judgment of a trained MDR to determine the presence or absence of a heat-related disorder. If the result of the evaluation indicates a heat-related case the MDR shall prepare a Heat/Cold Case form (NAVMED 6500/1). Appendix B2-G is an example of this form. The senior MDR must sign the form and the commanding officer shall forward the form to: Commanding Officer, Navy Environmental Health Center (NAVENVIRHLTHCEN). This form is available under stock number 0105-LF-015-0800. Submission of this form to NAVENVIRHLTHCEN will assist BUMED in identifying both personnel and material areas that require assistance in achieving better heat-stress control.

**NOTE:**

If a heat-stress case results in 5 or more lost workdays, a Mishap Report shall be submitted per chapter A-6 in addition to the submission of the Heat/Cold Case form.

(2) NAVENVIRHLTHCEN shall provide a fiscal year-end summary of ship-board heat-stress cases from their database by type of operation, and ship class to CNO (N454), COMNAVSEASYSOM (SEA 03L5), and the Fleet Commanders in Chief.

**B0205. PHEL DETERMINATION**

a. The WBGT index provides a measure of environmental conditions. In order to determine the permissible exposure limit in these conditions, an additional piece of information is required the degree of effort entailed by the particular job. The more strenuous the job, the shorter the allowable expo-

sure limit. The Navy has developed six physiological heat exposure limit (PHEL) curves, each applying to a different work rate, ranging from light work (PHEL Curve I) to heavy work (PHEL Curve VI). The PHEL Curve General Applicability table (table B2-A-1) in appendix B2-A provides the applicable stay times allowed for a specific WBGT reading. For types of work not presented in table B2-A-1, the MDR should consult reference B2-2, articles 3-12 and 3-13. For comparison, examples of light work include sweeping down, painting, adjusting automatic combustion controls, changing and cleaning lube oil strainers, and bleeding hydraulic oil. Examples of heavy work include manually chipping and wire brushing in preparation for painting, handling cargo and supplies, replacing large valves, cleaning lube oil sumps, and disassembly or reassembly of large or heavy equipment. The PHEL curves were developed and are accurate for normal, healthy personnel who have had adequate rest, (6 hours continuous sleep in the last 24 hours), adequate water intake, and adequate recovery time from previous heat-stress exposure (2 hours recover for every 1 hour exposure or 4 hours maximum). Personnel are assumed to be wearing clothing consisting of a least 35 percent cotton fiber, not containing starch, and readily permeable to water transfer. Table B2-A-2 presents the PHEL Chart in a tabular format. Table B2-A-3 presents the PHEL values in a tabular format for the presence of fuel combustion gases.

b. **Procedures**

(1) **Curve Selection**

(a) **Routine Operations**. Applicable PHEL curves should be determined by selecting the appropriate curve listed in table B2-A-1.

(b) **Non-routine Operations**. Non-routine operations, such as performing operations in out-of-normal plant configurations, increases in normal watchstander work rate, and minor equipment casualties require the use of the next higher number curve above that specified in table B2-A-1 for routine operations. For example, if the stay time for a particular watchstander is determined to be PHEL Curve I during normal operations, then the exposure limit for the watchstander should be determined using PHEL Curve II during difficult or more active than normal watches.

(c) **Engineering Casualty Control Exercises**. Watchstanders shall have their stay times determined by selecting the appropriate curve listed in table B2-A-1.

(d) **Heavy Work**. Personnel conducting heavy repairs or other strenuous work shall have their stay time determined by using PHEL Curve VI.

(2) **Effects of Personnel Health Status on Curve Selection**. As indicated, the PHEL curves and the assignment in table B2-A-1 are based on normal, healthy personnel who have adequate rest and recovery from previous heat-stress exposures. Personnel having repetitive exposures to heat stress without sufficient recovery may experience cumulative fatigue. Additionally, personnel with a respiratory system cold and/or infection, lacking sufficient sleep (less than 6 hours in the past 24 hours), experiencing dehydration, having clinically confirmed hypertension or taking medication which adversely affects body temperature are much more prone to systemic heat injuries. Maximum exposure limits for these personnel cannot be reliably predicted using the PHEL Chart in table B2-A-1. The senior MDR on a case-by-case basis shall determine appropriate exposure limits for these personnel.

(3) **Curve Selection if Personnel Heat Injuries Occur**. If, after determining personnel stay times per this section, a heat exhaustion or heat stroke occurs, then the stay times for all other personnel in the space shall immediately be reduced by recalculating stay times using the next numerically

higher PHEL curve than specified by table B2-A-1. The work and health status of the individual suffering the injury shall be reviewed. When the cause of the injury has been reasonably resolved, the stay times for personnel in the space shall be determined using the latest WBGT index and the normally appropriate curves as indicated in table B2-A-1.

(4) **WBGT/PHEL Determination.** The heat-stress surveyor shall use the PHEL table (table B2-A-2). To use the PHEL table, the heat-stress surveyor must first round the recorded WBGT index to the next higher whole number value. This can be done easily as the WBGT index is recorded in tenths of a degree F. For example: 85.1°F would be rounded to 86°F and 89.9°F would be rounded to 90°F; but 92.0°F would remain 92°F. Using the whole number value of the WBGT index, the heat-stress surveyor would obtain the permissible stay time in hours and minutes under the column for the PHEL curve determined using table B2-A-2. Hence, for a recorded WBGT index of 85.1°F or 85.8°F the stay time for PHEL Curve III is 5 hours and 55 minutes.

(5) The current WBGT/PHEL index for each watch stander can be read from any of the ICAS or PC connected stations.

(6) **Impact of Personal Status Change on Exposure Limits.** If a person's status changes during the period of a watch, e.g., the person assumes a watch in a different location or works at a different exertion level, stay times shall be computed using the procedures for Remaining Safe Stay Times provided in reference B2-2, article 3-13(5)(b).

(7) **Impact of Fuel Combustion Gases (Stack Gas) and Fuel Vapors on Exposure Limits**

(a) Fuel combustion gases (stack gas) and fuel vapors can have severe physiological impact on personnel. The effects of these environmental factors are intensified by heat stress. Prolonged exposure to relatively low concentrations can impact the ability of personnel to work safely. If someone entering a workspace or area for the first time in approximately 4 hours or more can smell the odor of stack gas and/or fuel vapors, then a harmful concentration may be present. Personnel should be checked for the following symptoms:

1. Eyes watering and/or burning
2. Difficulty in breathing normally
3. Tingling or numbness of the tip of the tongue, tip of the nose, finger tips and/or toes
4. Generalized sensation of mild alcoholic intoxication without alcohol consumption within the past 24 hours.

(b) If two or more of the above symptoms are exhibited, then exposure limits must be reduced as follows:

1. Using the latest WBGT index values, determine the PHEL stay time by using table B2-A-3; or
2. Calculate the PHEL stay time for existing heat-stress conditions per paragraph B0205b(4), and divide that stay time by three to obtain the new stay time. For example, if the exposure limit due to heat stress is 4 hours, then the exposure limit with stack gas and or fuel vapors present would be reduced to 1 hour and 20 minutes. Prompt removal of affected personnel to fresh air is essential. Article 3-11 of reference B2-2 discusses the physiological effects to personnel exposed to stack gas and fuel vapors in detail.



**B0206. TRAINING**

a. All hands shall receive heat-stress training upon reporting aboard. This training may be conducted by showing the heat-stress videotape Play it Cool: Heat-Stress Prevention Afloat (8055801-DN), or by using the heat stress Lesson Training Guide available through the Navy Occupational Safety and Health and Environmental Training Center (NAVOSHENVTRACEN) website at <http://www.norva.navy.mil/navosh> at a minimum this training must include:

- (1) Heat-stress health hazards
- (2) Symptoms of excessive heat-stress exposure
- (3) Heat-stress first aid procedures
- (4) Heat-stress monitoring
- (5) Causes of heat-stress conditions.

b. Heat-stress surveyors assigned to perform WBGT surveys shall be trained and qualified using the Heat-Stress Surveyor Watchstation 303 (formally Heat-Stress Monitor Watchstation 303) of the Safety Programs Afloat Personnel Qualifications Standard (PQS), NAVEDTRA 43460-4B within 12 weeks of assignment.

---

**CHAPTER B2**

**REFERENCES**

- B2-1 Manual of the Judge Advocate General (JAG Manual)
- B2-2 NAVMED P-5010-3, Manual of Naval Preventive Medicine, chapter 3: Ventilation and Thermal Stress Ashore and Afloat (NOTAL)

Appendix B2-A

Table B2-A-1

PHEL CURVE GENERAL APPLICABILITY SELECTION

<u>PERSONNEL</u>	<u>PHEL CURVE</u>	
	<u>Routine Watch</u>	<u>Casualty Control Drills</u>
I. Steam Propelled Ships		
A. Propulsion Spaces		
1. BTOW	II	III
2. Console Operator	I	I
3. Upper Levelman (checkman)	II	III
4. Lower Levelman	II	III
5. MFP Watch	II	III
6. Burnerman	II	III
7. EOOW	I	I
8. MMOW	II	III
9. Throttleman	I	I
10. EMOW	I	I
11. Upper Levelman(SSTG)	II	III
12. Lower Levelman (Lube Oil/Condensate)	II	III
13. Evaporator Watch	I	II
14. Messenger (See Note Below)	III	IV

**NOTE:**

Messenger stay times should be determined by taking the average of all WBGT Index values for the space not including the console booth. In most cases this will give a longer stay time than using PHEL Curve values listed for the messenger above.

B. Auxiliary Spaces

1. All Watches	II	II
----------------	----	----

II. Diesel Propelled Ships

A. EOOW	I	I
B. POOW	II	III
C. EMOW	I	I
D. Throttleman	I	I
E. Repair Electrician	I	I
F. SSDG Watch	I	I
G. Boiler Watch	I	I
H. Evaporator Watch	II	II
I. Oiler/Messenger	III	IV

### III. Gas Turbine Propelled Ships

#### A. FFG-7, DD-963, and CG 47 Class Ships

1. All Engineering Watch Personnel	I	II
------------------------------------	---	----

#### B. DDG-51 Class Ships

1. ERO	II	II
2. PSM/ERM	II	III
3. ASM	II	III
4. AS/VCDO	II	III
5. Sounding and Security Watch	III	III
6. OD Box Watch	NA	*II

\*Includes restricted maneuvering and casualty control drills

#### C. AOE Class Ships

1. PSM	II	II
2. ASM	II	III
3. Auxiliary Rover	III	III

### IV. Steam Catapult Spaces

A. All Watches	II	II
----------------	----	----

### V. All Other Surface Ship Spaces

A. ECC Monitors/Inspectors	I	II
B. Laundry Personnel	III	NA
C. Scullery Personnel	V	NA
D. Galley & Food Service LineII Personnel		NA

### VI. Submarines

#### A. Engine Room

1. EOOW	I	I
2. EWS	II	III
3. Throttleman	I	I
4. Reactor Operator	I	I
5. Electrical Operator	I	I
6. Upper Level	II	III
7. Lower Level	II	III
8. Evaporator Watch	I	II
9. Engineering Drill Monitors	NA	II

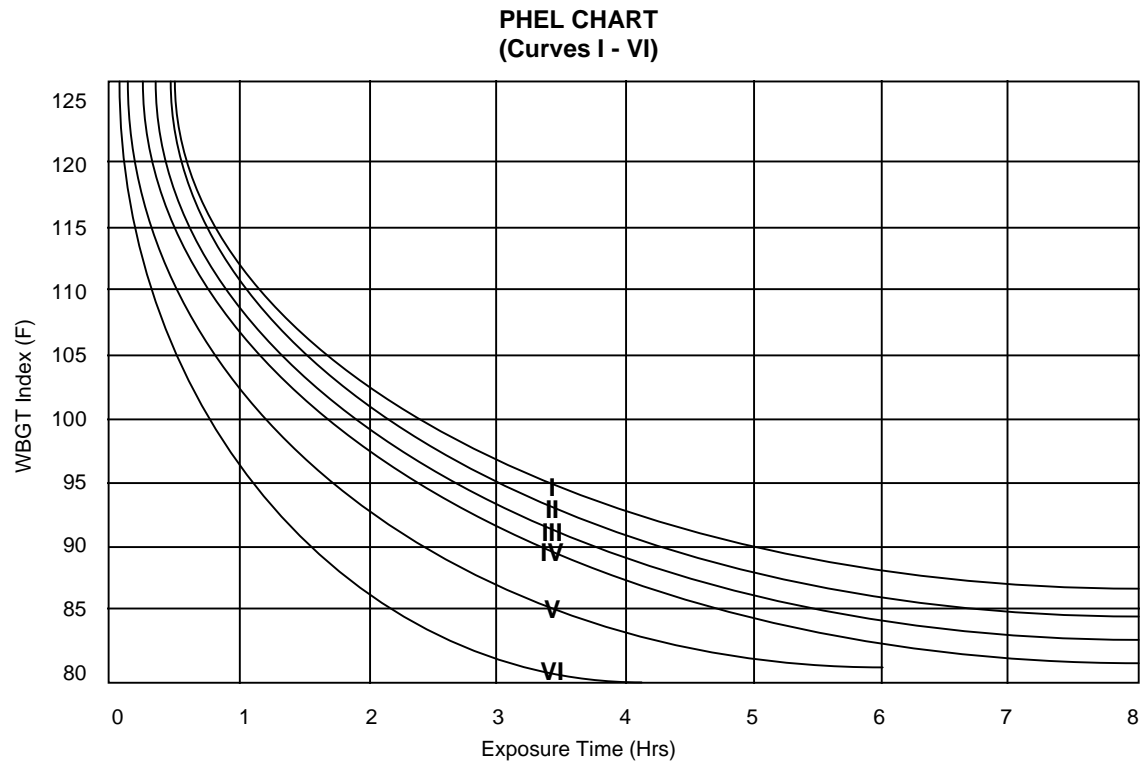
#### B. Auxiliary Spaces

1. All Watches	II	II
----------------	----	----

#### C. Other Spaces

1. Food Service Personnel	II	NA
---------------------------	----	----

FIGURE B2-A-1



**Table B2-A-2**

**PHYSIOLOGICAL HEAT EXPOSURE LIMITS (PHEL) TIME TABLE**  
(Without the presence of fuel combustion gases/fuel vapors)

<u>Six PHEL Curves (Total Exposure Time in Hours:Minutes)</u>						
WBGT Index (F)	I	II	III	IV	V	VI
80.0	>8:00	>8:00	>8:00	8:00	6:35	4:30
81.0	>8:00	>8:00	>8:00	7:45	6:00	4:05
82.0	>8:00	>8:00	8:00	7:05	5:25	3:40
83.0	>8:00	8:00	7:45	6:25	4:55	3:20
84.0	>8:00	8:00	7:05	5:55	4:30	3:05
85.0	8:00	7:45	6:30	5:20	4:05	2:50
86.0	8:00	7:05	5:55	4:55	3:45	2:35
87.0	7:25	6:30	5:25	4:30	3:25	2:20
88.0	6:45	5:55	4:55	4:05	3:10	2:10
89.0	6:10	5:25	4:30	3:45	2:50	2:00
90.0	5:40	5:00	4:10	3:25	2:40	1:50
91.0	5:15	4:35	3:50	3:10	2:25	1:40
92.0	4:50	4:10	3:30	2:55	2:15	1:30
93.0	4:25	3:50	3:15	2:40	2:00	1:25
94.0	4:05	3:35	3:00	2:25	1:50	1:15
95.0	3:45	3:15	2:45	2:15	1:45	1:10
96.0	3:25	3:00	2:30	2:05	1:35	1:05
97.0	3:10	2:45	2:20	1:55	1:25	1:00
98.0	2:55	2:35	2:10	1:45	1:20	0:55
99.0	2:40	2:20	2:00	1:40	1:15	0:50
100.0	2:30	2:10	1:50	1:30	1:10	0:45
101.0	2:20	2:00	1:40	1:25	1:05	0:45
102.0	2:10	1:50	1:35	1:15	1:00	0:40
103.0	2:00	1:45	1:25	1:10	0:55	0:35
104.0	1:50	1:35	1:20	1:05	0:50	0:35
105.0	1:40	1:30	1:15	1:00	0:45	0:30
106.0	1:35	1:25	1:10	0:55	0:45	0:30
107.0	1:30	1:15	1:05	0:50	0:40	0:25
108.0	1:20	1:10	1:00	0:50	0:35	0:25
109.0	1:15	1:05	0:55	0:45	0:35	0:25
110.0	1:10	1:00	0:50	0:40	0:30	0:20
111.0	1:05	1:00	0:50	0:40	0:30	0:20
112.0	1:00	0:55	0:45	0:35	0:25	0:20
113.0	0:55	0:50	0:40	0:35	0:25	0:15
114.0	0:55	0:45	0:40	0:30	0:25	0:15
115.0	0:50	0:45	0:35	0:30	0:20	0:15
116.0	0:45	0:40	0:35	0:25	0:20	0:15
117.0	0:45	0:40	0:30	0:25	0:20	0:10
118.0	0:40	0:35	0:30	0:25	0:15	0:10
119.0	0:35	0:35	0:25	0:20	0:15	0:10
120.0	0:35	0:30	0:25	0:20	0:15	0:10
121.0	0:35	0:30	0:25	0:20	0:15	0:10
122.0	0:30	0:25	0:20	0:15	0:15	0:10
123.0	0:30	0:25	0:20	0:15	0:10	0:10
124.0	0:25	0:25	0:20	0:15	0:10	0:05

05 October 2000

**TABLE B2-A-3**

(With the presence of fuel combustion gases/fuel vapors)

Six PHEL Curves (Total Exposure Time in Hours:Minutes)						
WBGT Index (F)	I	II	III	IV	V	VI
80.0	4:50	4:15	3:30	2:55	2:15	1:30
81.0	4:25	3:50	3:10	2:40	2:00	1:20
82.0	4:00	3:30	2:55	2:25	1:50	1:15
83.0	3:40	3:10	2:40	2:10	1:40	1:10
84.0	3:20	2:55	2:25	2:00	1:30	1:00
85.0	3:00	2:40	2:10	1:50	1:25	0:55
86.0	2:45	2:25	2:00	1:40	1:15	0:50
87.0	2:30	2:10	1:50	1:30	1:10	0:45
88.0	2:20	2:00	1:40	1:25	1:05	0:40
89.0	2:05	1:50	1:30	1:15	1:00	0:40
90.0	1:55	1:40	1:25	1:10	0:55	0:35
91.0	1:45	1:30	1:15	1:05	0:50	0:30
92.0	1:35	1:25	1:10	1:00	0:45	0:30
93.0	1:30	1:20	1:05	0:55	0:40	0:25
94.0	1:20	1:10	1:00	0:50	0:35	0:25
95.0	1:15	1:05	0:55	0:45	0:35	0:20
96.0	1:10	1:00	0:50	0:40	0:30	0:20
97.0	1:10	0:55	0:45	0:40	0:30	0:20
98.0	1:05	0:50	0:40	0:35	0:25	0:15
99.0	0:55	0:45	0:40	0:30	0:25	0:15
100.0	0:50	0:45	0:35	0:30	0:20	0:15
101.0	0:45	0:40	0:35	0:25	0:20	0:15
102.0	0:40	0:35	0:30	0:25	0:20	0:10
103.0	0:40	0:35	0:30	0:25	0:15	0:10
104.0	0:35	0:30	0:25	0:20	0:15	0:10
105.0	0:35	0:30	0:25	0:20	0:15	0:10
106.0	0:30	0:25	0:20	0:20	0:15	0:10
107.0	0:30	0:25	0:20	0:15	0:10	0:10
108.0	0:25	0:25	0:20	0:15	0:10	0:05
109.0	0:25	0:20	0:15	0:15	0:10	0:05
110.0	0:25	0:20	0:15	0:15	0:10	0:05
111.0	0:20	0:20	0:15	0:10	0:10	0:05
112.0	0:20	0:15	0:15	0:10	0:10	0:05
113.0	0:20	0:15	0:15	0:10	0:05	0:05
114.0	0:15	0:15	0:10	0:10	0:05	0:05
115.0	0:15	0:15	0:10	0:10	0:05	0:05
116.0	0:15	0:10	0:10	0:10	0:05	0:05
117.0	0:15	0:10	0:10	0:05	0:05	0:05

## Appendix B2-B

### HEAT STRESS TROUBLE-SHOOTING AND REPAIR ACTIONS

VENTILATION: If a ventilation problem is suspected, the WBGT meter should be positioned at the supply terminal/opening discharge such that the airflow is blowing into the left side of the WBGT meter. If the discharge air DB temperature is greater than 10°F over the outside DB temperature, then a ventilation supply problem may be indicated. A reading of 2 terminals/openings per ventilation supply system serving the space is required. The below information may assist in determining the cause of the problem.

<u>STANDARDS</u>	<u>HOW TO MEASURE DISCREPANCIES</u>	<u>CAUSES</u>	<u>RECOMMENDED ACTION</u>
1. VENTILATION			
NSTM 510 Heating, Ventilation and Air Conditioning systems for Surface Ships			
a. <u>Supply</u>			
(1) <u>Flow</u>			
Duct velocity 2500 to 3500 fpm	Anemometer	Inlet obstructed	Remove obstructions
Velocity of airflow at watchstander (NAVMED P-5010-3) about 250 fpm minimum		Dirty screens	Clean Screens
		Wrong screen mesh (1-1/2 inches required)	Replace with proper size mesh
		Toxic Gas Vent Dampers closed	Open and repair dampers
		Vent duct pressure losses due to dirty ductwork, leaks, unauthorized openings or missing access covers	Clean, repair or replace
(2) <u>Flow</u> (continued)			
		Supply terminal obstructed	Clean the terminal
		Terminal inoperable or missing	Replace terminal
		Supply fan not working properly:	Repair

OPNAVINST 5100.19D  
05 October 2000

Enclosure (1)

Appendix B2-B

B2-B-2

<u>STANDARDS</u>	<u>HOW TO MEASURE DISCREPANCIES</u>	<u>CAUSES</u>	<u>RECOMMENDED ACTION</u>
		-Motor speed low (single phase or miswired)	Repair
		-Controller defective	Repair/Replace
		-Improper speed with exhaust fan	Repair fan interlock
		-Failed motor bearings	
		Supply air short circuited by exhaust terminal	Repair
			Relocate supply or exhaust terminal
At least one supply terminal at each watch-stander station without damper, which can be pointed at the watch-stander	Visual	Incorrect terminal type (should be corrosion resistant steel)	Replace terminal
		Terminal damper is not removed	Remove damper
High Efficiency Filters (HEPA) are dirty. (Ships equipped with a Collective Protection System)	HEPA filter differential pressure gauge. (See PMS)	Continuous use in a dirty environment such as an industrial availability or sand storm)	Replace filters
<b>b. <u>Exhaust</u></b>			
Refer to specific HVAC Design Criteria Manual (DCM) for ship class. If no specific DCM exist for the ship class in question, refer to NAVSEA 0938-018-0010 (A/C & Ventilation DCM for Surface Ships). Exhaust ventila-	Anemometer	Exhaust fan not working properly:	
		-Motor speed low (single phase or miswired)	Repair
		-Controller defective	Repair
		-Improper speed with ex-	Repair fan interlock



<u>STANDARDS</u>	<u>HOW TO MEASURE DISCREPANCIES</u>	<u>CAUSES</u>	<u>RECOMMENDED ACTION</u>
<p>tion is to be:</p> <p>-125% of supply ventilation for 1200 psi steam ships.</p> <p>-115% of supply ventilation for other ships except CPS ships</p> <p>-equal to supply ventilation on CPS ships plus sweep air from Type II airlocks</p>		<p>haust fan</p> <p>-Failed motor bearings</p>	<p>Repair</p>
<p>Space pressure negative at ¼ to ½ inch of water is mandatory with supply and exhaust fans at the same speed (airflow should be into space when access is opened)</p>	<p>U-Tube Manometer</p>	<p>Exhaust inlet or outlet obstructed.</p> <p>Dirty screens.</p> <p>Wrong screen mesh (1-1/2 inches required.</p>	<p>Remove obstructions.</p> <p>Clean Screens.</p> <p>Replace with proper size mesh.</p>
	<p>Feel/visual</p>	<p>Vent duct pressure losses due to dirty ductwork, leaks, unauthorized openings or missing access covers.</p>	<p>Clean, repair or replace</p>
		<p>Toxic Gas Vent Dampers closed</p>	<p>Open and repair dampers</p>
<p>Exhaust terminals in hot spots</p>	<p>Feel/Visual</p>		<p>Relocate terminal</p>
<p>2. INSULATION</p>			
<p>a. Piping &amp; Machinery NSTM 635 Thermal, Fire and</p>	<p>Visual Check</p>		
<p>b. Acoustic Insulation Insulate all surfaces with temp.&gt;125°F. Material/thickness IAW MIL-STD-769</p>	<p>Deteriorated cracked, worn, damaged</p>	<p>High traffic, walkway, standing, use of chain falls, etc.</p>	<p>Replace and install metal lagging/shielding</p>

Appendix B2-B  
Enclosure (1)

STANDARDS	HOW TO MEASURE DISCREPANCIES	CAUSES	RECOMMENDED ACTION
	Wet (water, oil, etc.)	Frequently occurring external leak	Replace and cover with metal lagging/shielding
		Internal/ external one-time leak	Replace
	Missing insulation	Removed for access	Replace
		Replaceable pad missing Valve bonnets, etc	Install replaceable pad
c. After insulation is installed, surface temperature should not exceed 125°F. <b>*Note 1, 2</b>	Infrared hand-gun/ pyrometer-Note 1 Surface temp too high.	Insulation deteriorated/ compacted.	Increase insulation thickness.
		Insulation too thin.	Paint surface with aluminum paint.
3. <u>STEAM/WATER LEAKS</u>			
a. <u>Turbine Shaft Seals</u>			
NSTM 231Propulsion and SSTG Steam Turbines			
Excessive shaft seal leakage, slight leakage is required to lubricate the shaft seals.	Visual	Shaft alignment	Align shaft
		Worn bearings	Replace bearings
		Improper or worn packing	Replace packing installation
Excessive shaft gland seal leakage, some turbine shaftseals are vented to a gland leak off system	Visual	Seal leaks beyond capacity of leak-off system	Repair Seal
		High exhaust steam Pressure	Rework exhaust dump Value
		Low vacuum in gland leak	

B2-B-4

<u>STANDARDS</u>	<u>HOW TO MEASURE DISCREPANCIES</u>	<u>CAUSES</u>	<u>RECOMMENDED ACTION</u>
		off system (less than 1/2 inch vacuum)	Secure unneeded auxiliary machinery.  Check loop seals. Isolate idle equipment. Ensure gland exhaust fan operating
b. <u>Mechanical Pump Seals</u>			
NSTM 503 Pumps	Visual	Shaft alignment	Align shafting
		Worn bearings	Replace bearings
		Improper or worn package installation	Replace when leakage forms a stream
c. <u>Pump Stuffing Boxes</u>			
NSTM 503 Pumps	Visual	Packing not sufficiently tight	Tighten packing
Check for leakage for greater than 32 oz./ min	Measure	Gland bottomed out	Add packing
		Shaft alignment	Align shaft
		Worn bearings	Replace bearings
		Improper or worn packaging	Replace packing
d. <u>Casing Joints</u>			
NSTM 221 Boilers	Visual	Dirt on matting surfaces	Clean Surfaces
Check all areas of boiler casings for leakage	Feel	Improper bolt tightening	Retighten bolts
	Soap Suds	Warped doors/access	Replace doors/panels
		Cracked seams, fasteners miss- ing or defective, faulty gas- kets	Caulk seams, renew fas- teners, replace/renew gaskets use tadpole gas- kets
e. <u>Piping</u>			

Enclosure (1)

Appendix B2-B

B2-B-6

<u>STANDARDS</u>	<u>HOW TO MEASURE DISCREPANCIES</u>	<u>CAUSES</u>	<u>RECOMMENDED ACTION</u>
NSTM 505 Piping Check for stained and wet lagging <b>*Notes 3, 4</b>	Visual	Pipe, valve or flange leaking  Pipe broken	Repair or replace as nec- essary  Replace
f. <u>Drains, Funnel</u>			
No overflow	Visual	Check valve jammed  Drain funnel fouled	Repair check valve  Clean drain funnel
4. <u>BILGE</u>			
a. <u>Dry Bilge Ships</u>			
No water	Visual	Leaks Machinery Piping	Repair leaks
b. <u>Wet Bilge Ships</u>			
Minimize water (no quantitative standard)	Visual	Leaks Machinery Piping	Pump bilge water and/ or repair leaks

**\*Note 1** For ships designed to MIL-STD 769D or earlier revisions, the surface temperature after installing insulation was limited to 105°F.

**\*Note 2** Infrared Heat Gun Survey: Infrared heat guns may be borrowed from IMA or IMA requested to perform. (Heat gun should be used to detect hot spots. This equipment does not provide accurate temperatures.)

**\*Note 3** Use extreme caution when inspecting pressurized or high temperature piping systems. Do not attempt repairs while system is pressurized.

**\*Note 4** Prior to removing lagging ensure that it does not contain asbestos

**Appendix B2-C**

**USE OF THE WBGT METER**

1. The basic instrument for assessing heat stress is the WBGT meter - a small, lightweight, portable instrument. The WBGT meter measures dry-bulb, wet-bulb, and globe temperature and electronically integrates these values into the WBGT Index. There are currently two meters available in the fleet: the RSS-220 meter and the Model 960. Each meter is assembled and operated per its technical manual, either NAVSEA SN000-AA-MMO-0010 for the RSS 220 meter, or NAVSEA S9491-AJ-MMO-010/0910/LP-464-1300 for the Model 960 meter, and the guidance contained within this instruction. Specific instructions for requisitioning and turn-in of units are available from Type Commanders. The Allowance Equipage List (AEL) for the meter is AEL 2-870003051. Experience has shown that the meter globe assembly may be damaged before the meter itself is damaged. Replacing the globe assembly, in the event of meter malfunction, may often eliminate the need to return the entire meter for repair. Similarly, the rechargeable batteries should also be checked before returning the entire meter for repair.

Supply information for the meter and accessories is:

a. **Model RSS-220**

- (1) WBGT Meter. NSN 7H-6685-01-055-5298
- (2) Globe Assembly. NSN 9G-6685-01-149-8635
- (3) Standard Nickel Cadmium Rechargeable Size AA Batteries.  
NSN 9G-6140-00-449-6001
- (4) WBGT Meter Accessories Allowance Parts List (APL) 100110001

b. **Model 960**

- (1) Heat Stress Monitor. NSN 3H 6665-01-333-2590
- (2) Globe Assembly. Unavailable from SPCC at this time.
- (3) Standard Nickel Cadmium Rechargeable Size AA Batteries. NSN 9G-6140-00-449-6001
- (4) Heat Stress Monitor Allowance Parts List (APL) 469990172

2. **WBGT Index.** Environmental data displayed by the WBGT meter (heat stress monitor) are:

- a. Shielded, ventilated dry-bulb temperature (DB)
- b. Shielded, ventilated wet-bulb temperature (WB)
- c. Globe temperature (GT). This temperature is an integration of radiant and convective (the heating or cooling effects of air movement) heat transfer (heat gained or lost).

05 October 2000

d. **WBGT Index.** The meter calculates this value using the following mathematical equation:

$$\text{WBGT} = (0.1 \times \text{DB}) + (0.7 \times \text{WB}) + (0.2 \times \text{GT})$$

e. **Exposure Limit (Model 960 only).** The calculated exposure limit can be read off the display for each of the PHEL curves (P1 through P6 positions). The heat stress monitor uses the data of appendix B2-A to perform this calculation.

### 3. **Use of the WBGT Meter (RSS-220)**

a. The procedure for turning on the WBGT meter readies it for operation. The turn-on procedure is:

(1) Install the globe sensor by pushing the phone jack on the base of the sensor into the receptacle on top of the meter. Hold the globe sensor by its phone jack end, not by the black sphere. The globe can easily be damaged by squeezing, bumping, or dropping.

(2) Fill the wet-bulb water reservoir. The reservoir is accessible through the end of the tunnel marked WATER FILL. When filled, water should completely cover the sponge and be well below the level of the tunnel. Excess water can be poured out of the tunnel end. Be careful to keep the dry-bulb sensor dry. If it becomes wet, dry it with tissue or a soft cloth before operating the meter.

(3) Turn the power switch to CHECK. Listen for the sound of the aspirating fan and see digits on the display.

(4) Turn the measurement function switch to DB, WB, GT, and WBGT. Wait 5 minutes for the initial reading (DB). Wait 3 minutes for subsequent readings. Each position will give a display reading of  $100.0 \pm 0.2^{\circ}\text{F}$ , if the meter is operating properly. If the proper reading cannot be obtained, do not use the meter.

(5) Turn the power switch to ON.

b. When taking measurements, the order in which the temperatures and WBGT Index are presented in paragraph 3a (DB, WB, GT, and WBGT Index) is the order in which data must be collected to ensure optimum reliability. This is the same order in which the meter will display data as the Parameter Selection Switch is rotated clockwise from the DB position and is the order in which the individual sensors will stabilize (most to least quickly). As each value is obtained, it shall be recorded to the nearest  $0.1^{\circ}\text{F}$  on a Heat Stress Monitoring Sheet (see paragraph B0204c(3)(a) for recording procedures). As the meter is moved from one site to another, the meter should be at each site for 5 minutes to allow for stabilization of the first reading (DB) in the series to be taken. To determine when each sensor has stabilized, the monitor should watch the  $0.1^{\circ}\text{F}$  digit of the display. When the  $0.1^{\circ}\text{F}$  digit stops changing or when it oscillates between a larger or smaller value, the sensor has stabilized and the value can be recorded. (If oscillating, always record the higher of the two values.)

05 October 2000

c. While taking readings, hold the meter about chest high, 1 foot away from the body. If there is airflow at the reading location, the meter should be positioned to allow the airflow to enter the left side of the meter.

#### 4. Use of the Heat Stress Monitor (Model 960)

a. The procedure for readying the heat stress monitor for operation is as follows:

(1) Fill the wet bulb reservoir. Flip up the top of the reservoir filler cap. Using the supplied filler bottle, fill the reservoir to the full mark. Push the cap cover down until it snaps in place.

(2) Install the globe assembly by removing it from the carrying case and inserting the globe plug into the receptacle on the top of the monitor. Be careful not to get skin oils on the globe.

(3) Turn the monitor ON. Turn the TEST switch to TEST. The display will show either EE.E or 88.8. The EE.E means that the monitor has failed the test. The 88.8 means that the electronic portion of the unit is ready for use. If the monitor fails the test, check the battery charge level. If the level is low, charge the batteries. If the batteries are not low or the monitor fails the test after charging, the meter must be repaired.

(4) Turn the TEST switch to RUN. Check top of the bar in the Battery Charge Level window. If the top of the bar is in the green section, the batteries are well charged. If the top of the bar is in the yellow section, the batteries will need recharging soon. If the top of the bar is in the red section, the batteries must be recharged before use.

b. While taking readings, hold the meter about chest high, 18 inches away from the body. If there is airflow at the reading location, the monitor should be positioned to allow the airflow to enter the left side of the unit. When taking a measurement, the order in which the temperatures and WBGT index are taken are DB, WB, GT, and WBGT. Wait 5 minutes after turning the monitor on until taking the initial reading. Allow the temperature to stabilize before taking the subsequent readings. Following temperature readings, position the function switch to the PHEL curve (P position) from appendix B2-A which corresponds to the routine limit, the non-routine limit, the heavy work limit, and the drills limit. The exposure limits should be checked against table B2-B-2.

#### 5. Periodic WBGT Meter Validation

a. Each series of WBGT meter readings shall be validated by manually calculating the highest WBGT Index obtained using the equation of paragraph 2d above. This calculation shall be performed in the remarks section of the Heat Stress Monitoring Sheet. The reported WBGT Index value from the meter reading should agree within plus or minus 0.2°F of the calculated WBGT Index value. If such agreement is not obtained, the following causes of error shall be considered:

(1) The operator may have rushed through the measurement procedures not allowing the sensors to stabilize.

(2) The operator may have misread or recorded the values incorrectly.

05 October 2000

- (3) The meter may not be functioning properly.

If agreement is not obtained, the operator shall conduct a meter check per the appropriate Technical Manual. If the meter check is satisfactory, the operator shall retake the meter readings, ensuring that the meter is allowed to stabilize properly prior to obtaining readings and ensuring that values are recorded properly. If the meter check is unsatisfactory, the operator shall obtain another WBGT meter and retake the readings.

b. During reviews of Heat Stress Monitoring Sheets by the MDR, the department head, and other supervisors, the temperature and WBGT Index values should be spot-checked to determine obvious errors. The following rules of thumb should be applied:

- (1) WB temperatures must be less than DB temperatures ( $WB < DB$ )

**NOTE:**

If the WB temperature equals the DB temperature, the wick over the WB sensor is probably dried out. Check that there is water in the WB reservoir.

- (2) GT for each set of readings should be greater than or equal to DB temperature for the same set of readings ( $GT \geq DB$ )

- (3) WBGT Index must be greater than WB temperature and less than the GT ( $WB < WBGT < GT$ ).

- (4) The higher the overall heat stress, the more important it is to periodically check the meter's WBGT Index value by manually calculating the WBGT Index. It is the reliability of the individual data and WBGT Index which determines the reliability of the exposure limit from the PHEL Chart or Table.

**6. Emergency Environmental Monitoring Equipment Method**

The emergency environmental monitoring equipment method discussed here will almost always significantly underestimate the level of heat stress; this shortfall will result in an increased risk of personnel suffering heat injury. When there are no operable WBGT meters aboard ship, there are two alternative monitoring methods that may be used while the ship is underway. Motorized psychrometers (NSN 1H-6685-00-936-1389), carried aboard ships for meteorological purposes or commercially available hygrometers. These psychrometers only measure DB and WB temperatures. They do not have a globe thermometer and therefore cannot account for radiant and convective heating or cooling. Hence all of the components in the WBGT Index equation are not available to calculate the WBGT Index. If using the motorized psychrometric DB and WB temperatures must be measured with the psychrometer shield in its proper position (the flared-open end of the shield must be facing away from the psychrometer). GT can be approximated by taking the difference ( $\Delta T$ ) between the DB temperature and the GT under similar plant operating conditions (power level, number of operating boilers, and approximately the same load on the propulsion plant) when a full set of WBGT meter measurements were obtained. This difference ( $\Delta T$ ) should be added to the DB temperature measured with the psychrometer. For example:



05 October 2000

$$\begin{array}{rclcl} \frac{\text{Previous DB}}{98.3} & - & \frac{\text{Previous GT}}{110.4} & = & \frac{\Delta T}{12.1} \\ & - & & = & \end{array}$$

$$\begin{array}{rclcl} \frac{\text{Psychrometer DB}}{99.1} & - & \frac{\text{Psychrometer WB}}{83.6} & = & \frac{\text{Estimated GT(DB+ } \Delta T)}{99.1 + 12.1 = 111.2} \\ & - & & = & \end{array}$$

$$\text{WBGT} = (0.1 \times 99.1) + (0.7 \times 83.6) + (0.2 \times 111.2)$$

$$\text{WBGT} = 90.7$$

The WBGT Index values obtained by this strictly emergency monitoring method should be used with the PHEL Chart (figure B2-B-1) or Tables (tables B2-B-2 and B2-B-3). The resultant exposure limits will be approximations only.

Records should indicate whenever the emergency environmental monitoring equipment method was used. A casualty report shall be submitted. When reporting meter failure, give the serial and model numbers and describe the problems encountered.

**Appendix B2-D**  
**HEAT STRESS SURVEY SHEET**

HEAT STRESS SURVEY SHEET										
DATE: _____										
STATION	TIME	DB HANGING	DB	WB	GT	WBGT	ROUTINE <sup>(2)</sup> CURVE/LIMIT	NON-ROUTINE CURVE/LIMIT	DRILLS CURVE/LIMIT	HEAVY WORK CURVE/LIMIT
BTOW							II =	III =	III =	VI =
Upper Level (Checks)							II =	III =	III =	VI =
Lower Level							II =	III =	II =	VI =
MFP Watch							II =	III =	III =	VI =
Burnerman							II =	III =	III =	VI =
Messenger <sup>(1)</sup>							III =	IV =	IV =	VI =
Engineroom Console Booth 2)							I =	I =	I =	VI =
Throttle							I =	I =	I =	VI =
EMOW							I =	I =	I =	VI =
Evaporators							I =	II =	II =	VI =
Upper Level							II =	III =	III =	VI =
Lower Level							II =	III =	III =	VI =
Messenger (1) 3)							III =	IV =	IV =	VI =
3)										
Laundry Press Area							III =	NA =	NA	VI =
Driers							III =	NA =	NA	VI =
Scullery							V =	NA =	NA	VI =
Galley							II =	NA =	NA	VI =
Serving Line							II =	NA =	NA	VI =

OPNAV 5100/17 (Rev. 5-99)

NOTE: (1) Messenger stay times should be determined by taking the average of all WBGT Index values for the space not including the console booth.

NOTE: (2) Only the column that pertains to the current watch/work situation needs to be completed (e.g. all four columns do not need to be filled in).

## FOLLOW-ON SURVEY SHEET

NEXT REPORTING:

REQUIRED TIME: \_\_\_\_\_ LOCATION: \_\_\_\_\_  
WATCH DURATION: \_\_\_\_\_

SURVEY COMPLETE: \_\_\_\_\_ MONITORING DB AND/OR WB: \_\_\_\_\_

MANUAL WBGT CALCULATION:

WBGT = (0.1 X \_\_\_\_\_) + (0.7 X \_\_\_\_\_) + (0.2 X \_\_\_\_\_)  
LOCATION: \_\_\_\_\_ DB WB GT

WBGT (CALCULATED): \_\_\_\_\_ METER READING: \_\_\_\_\_ SAT/UNSAT  
(Standard of comparison 0.2°F)

COOL DRINKING WATER AVAILABLE AT WATCH/WORK STATIONS? YES / NO

DISCREPANCIES NOTED:

SURVEYOR'S SIGNATURE: \_\_\_\_\_

REVIEWED: \_\_\_\_\_ TIME/DATE: \_\_\_\_\_  
(SPACE SUPERVISOR/EOOW)

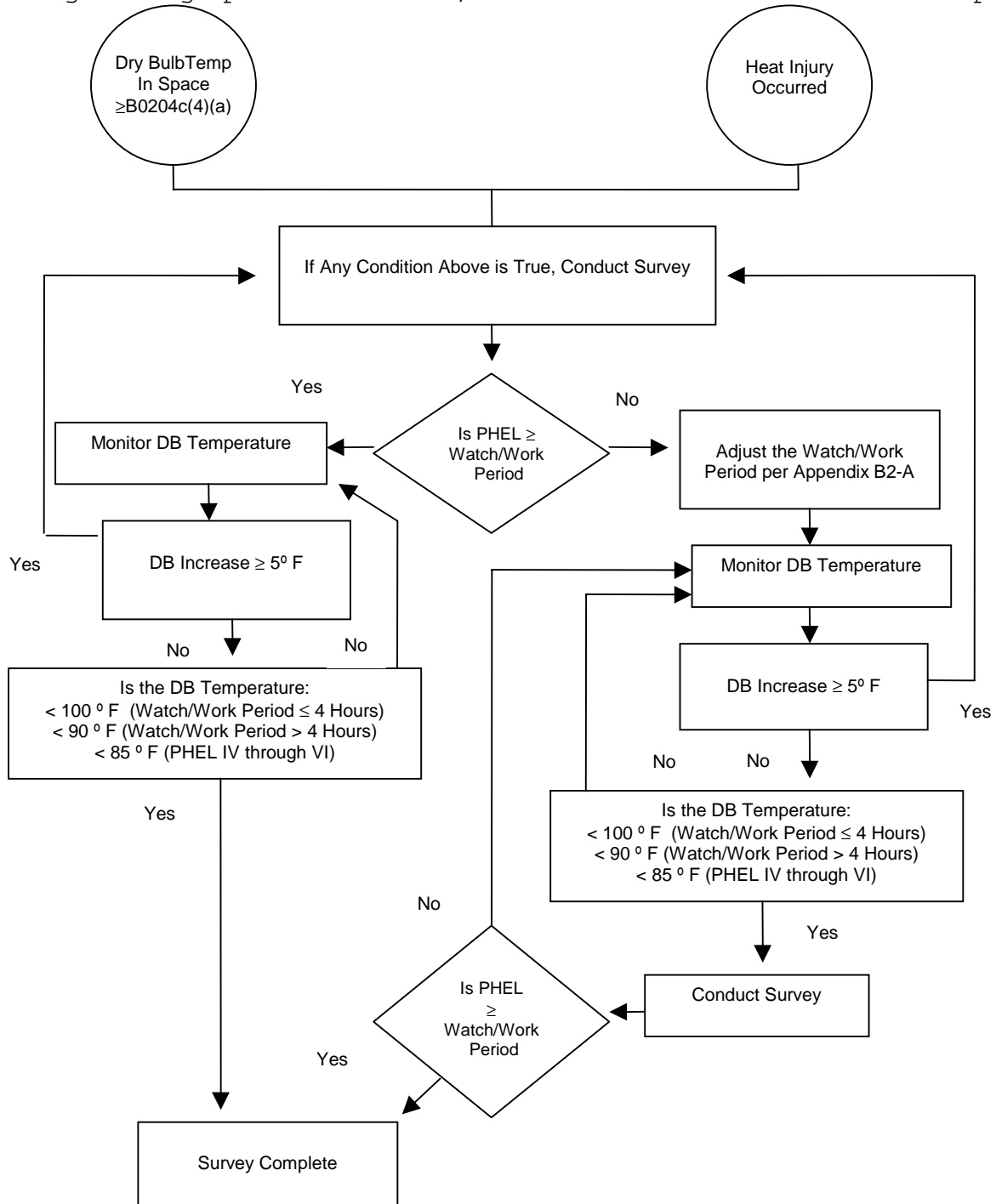
DEPT HEAD: \_\_\_\_\_ MDR: \_\_\_\_\_ XO: \_\_\_\_\_ CO: \_\_\_\_\_

COMMENTS:

Appendix B2-E

HEAT STRESS DECISION DIAGRAM

For Engineering Spaces on Nuclear, Gas Turbine and Diesel Powered Ships

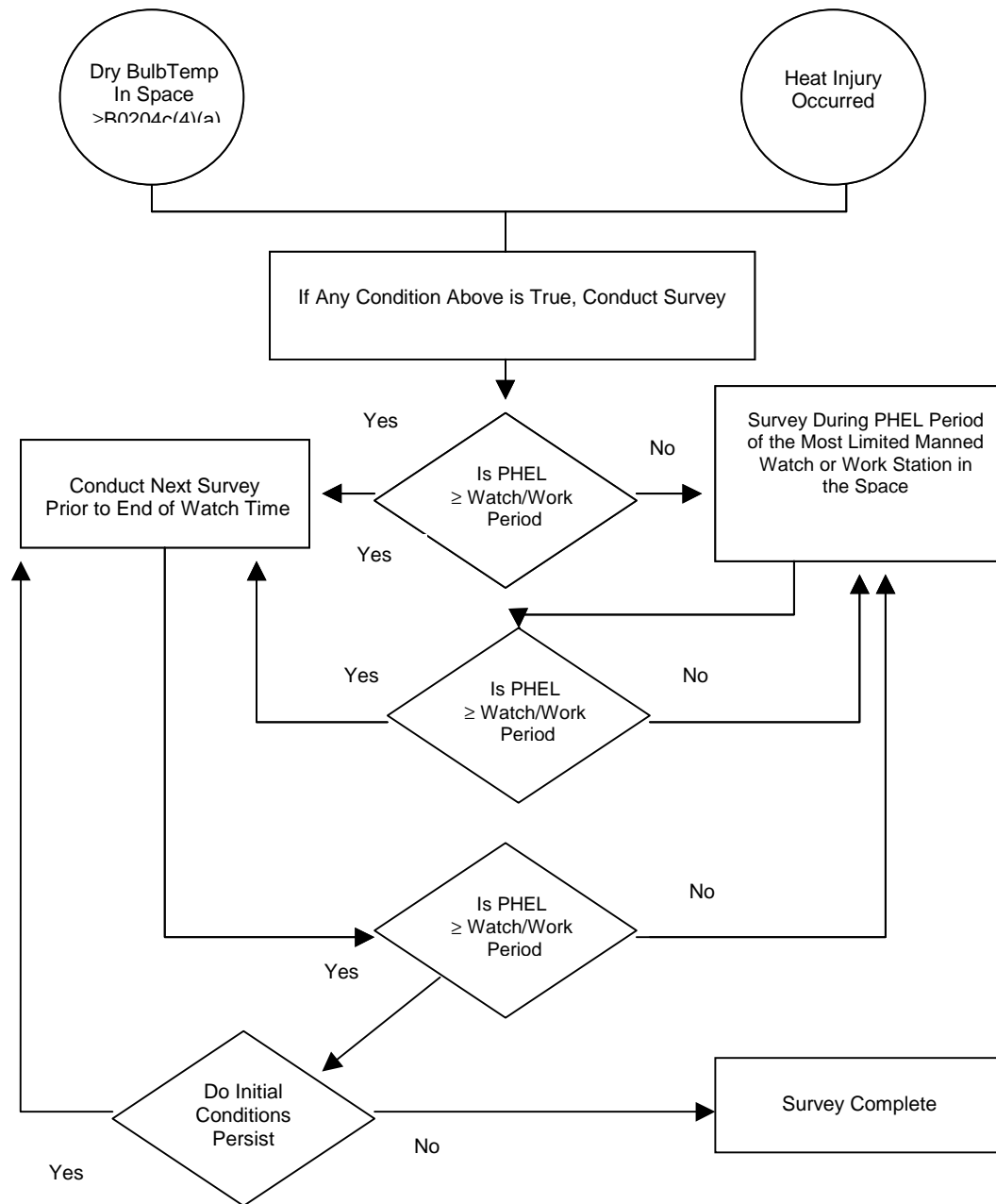


Appendix B2-E

HEAT STRESS SURVEY DECISION DIAGRAM

For Engineering Spaces on Steam Powered Ships and for Laundries, Sculleries, Galleys, Steam Catapult Spaces and Arresting Gear Spaces

**NOTE:** Follow-on surveys where WB and DB temperatures are **NOT** monitored and recorded each hour

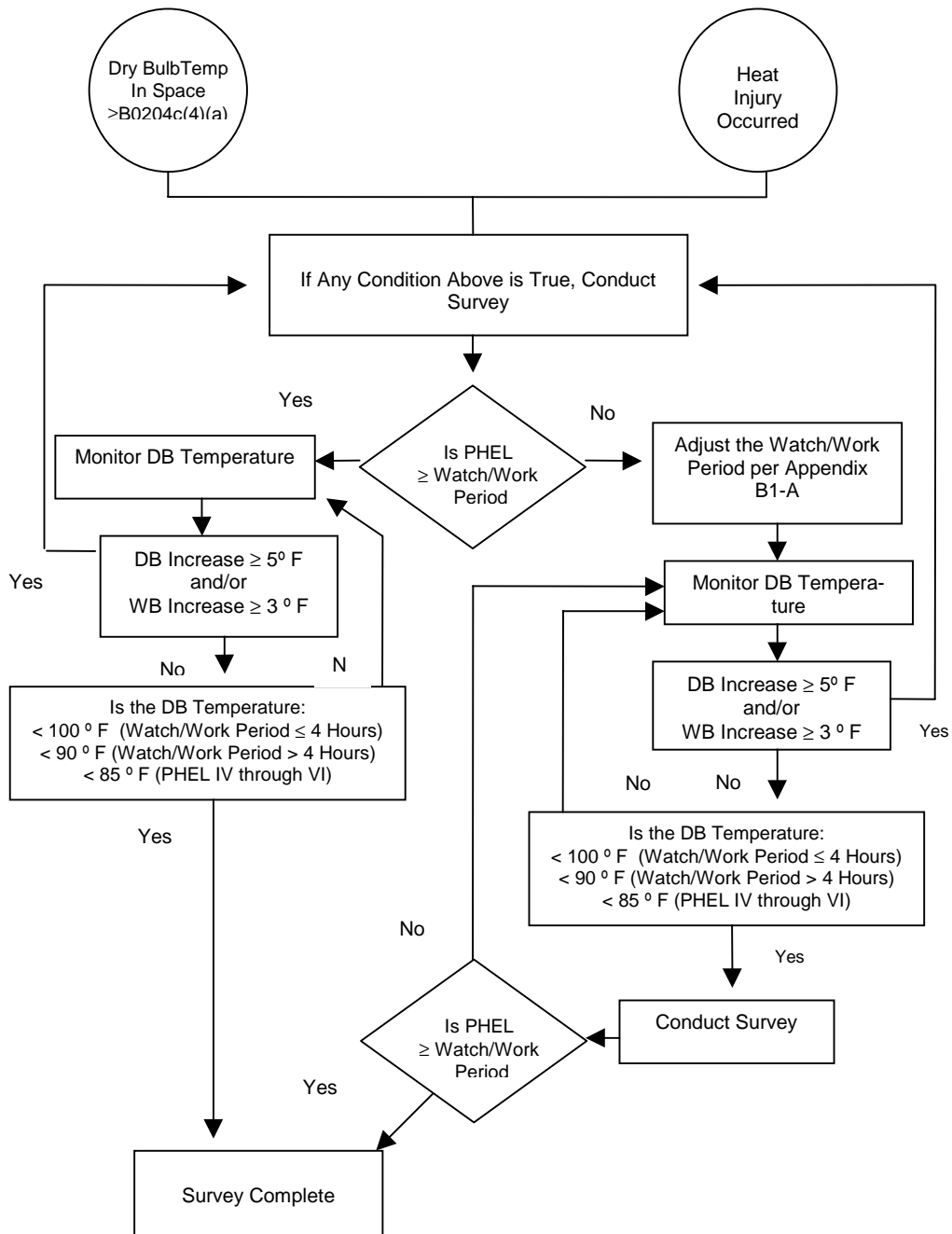


Appendix B2-E

HEAT STRESS SURVEY DECISION DIAGRAM

For Engineering Spaces on Steam Powered Ships and for  
Laundries, Sculleries, Galleys, Steam Catapult Spaces, Arresting Gear Spaces

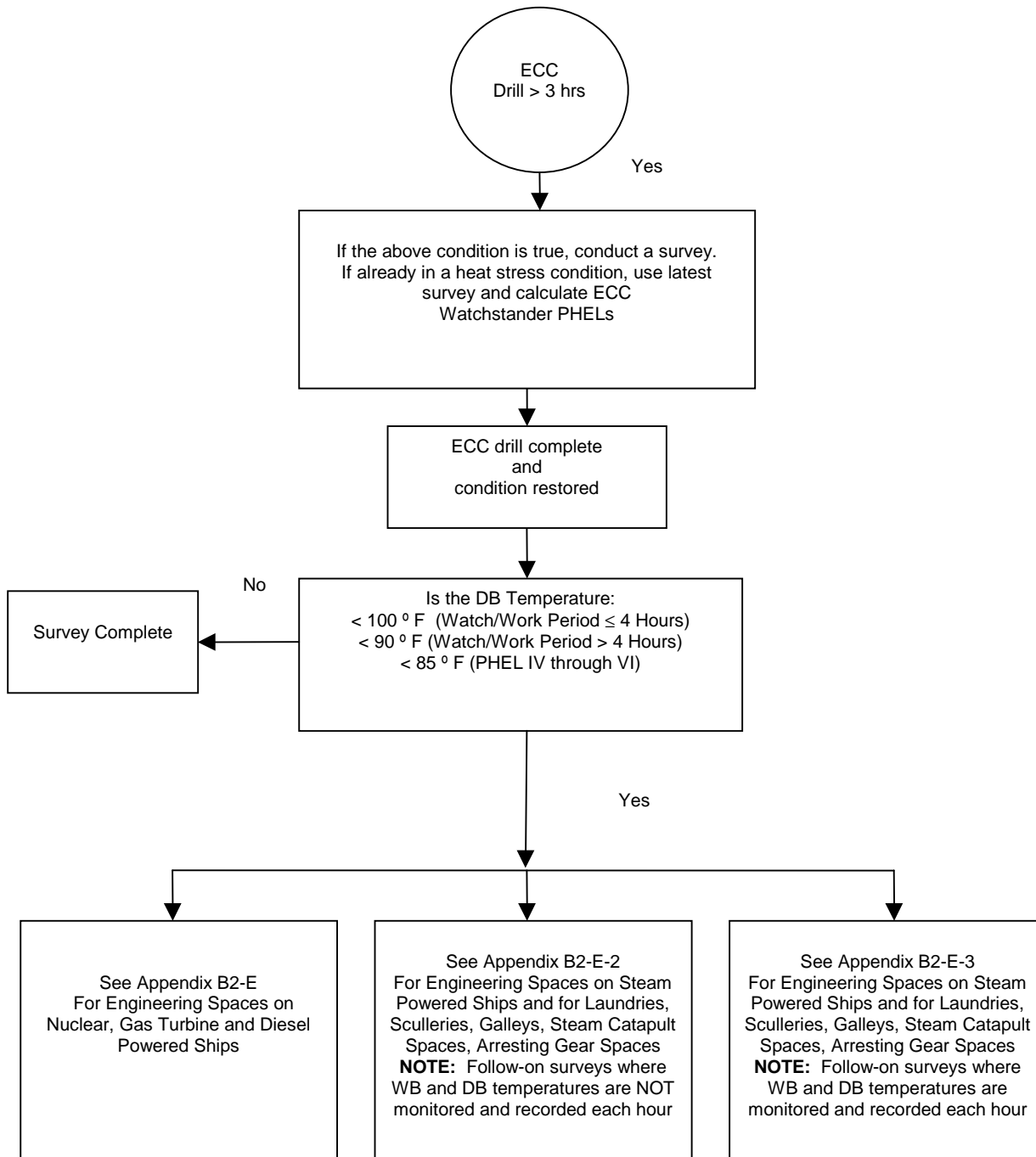
**NOTE:** Follow-on surveys where WB & DB temperatures are monitored and recorded each hour



**Appendix B2-E**

**HEAT STRESS SURVEY DECISION DIAGRAM FOR ECC DRILLS**

**NOTE:** Not required in spaces not affected by the drill or in areas that are unmanned



Appendix B2-F

TIME WEIGHTED MEAN (TWM) WBGT VALUES

Time Weighted Mean (TWM) WBGT Values. The TWM WBGT is intended for use in especially hot environments where reduced stay times have been imposed on watchstanders. The TWM WBGT is an optional provision, for use if an air-conditioned booth or cooler space is available for personnel to spend time in the cooler climate and afford some relief from the heat in the space. When the TWM is used it changes the WBGT value for that individual and increases the length of time spent at watch station. Ships that have this ability may properly calculate the new WBGT value using the following equation:

$$\text{Time (booth)} = \frac{[\text{WBGT (WATCH STATION)} - [\text{WBGT (desired)}]] \times 60}{[\text{WBGT (watch station)} - \text{WBGT (booth)}]}$$

For example: Engineering spaces on a steam-powered ship in the Indian Ocean are on a 4-hour watch rotation. The temperature on a hanging DB thermometer in a main space measured 101°F during the latest heat-stress survey:

Burnerman	WBGT = 92, PHEL = II,	Stay time = 4:10
Lower Levelman	WBGT = 92; PHEL = III;	Stay time = 3:30
Console Booth	WBGT = 80; PHEL = I;	Stay time = 8:00

The lower levelman has a stay time less than 4 hours while other watch stations have stay times that are equal to greater than 4 hours. The engineer office decides to incorporate a TWM WBGT for the lower levelman to maintain a 4-hour watch for all watchspace personnel. He/she looks up the WBGT value (in the PHEL Time Table in appendix B2-A) to achieve a 4-hour stay time (90 WBGT = stay time of 4 hours) and does the calculation. The time that the lower levelman must spend in the cool booth each hour to achieve a 4-hour watch would be calculated as follows:

For the Lower Levelman:

$$\text{Time (booth)} = \frac{[\text{WBGT (watch station)} - [\text{WBGT (desired)}]] \times 60}{[\text{WBGT (watch station)} - \text{WBGT (booth)}]}$$

The 90 WBGT value is from the PHEL Table in appendix B2-A

$$\text{Time (booth)} = \frac{92 - 90 \times 60}{92 - 80} = 10 \text{ minutes}$$

TWM WBGT information shall be documented on the heat-stress survey sheet.



05 October 2000

**Appendix B2-G**  
**FOR OFFICIAL USE ONLY (when filled in)**  
**HEAT/COLD CASE**

HEAT/COLD CASE								
FROM: (Reporting Activity) DATE _____  <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;">             Navy Environmental Health Center              NEHC-OEM Directorate              2510 Walmer Avenue              Norfolk, VA 23513-2617           </div>				NAME				
				SSN				
				GRADE	RATE	RACE	SEX	AGE
				BIRTHPLACE				
				DATE AND TIME OF EXAMINATION				
				UNIT TO WHICH ATTACHED				
				DATE REPORTED TO PRESENT STATION				
PRESENT ILLNESS (Onset Date and Time)	WBGT	DIAGNOSIS (check one) <input type="checkbox"/> DEHYDRATION <input type="checkbox"/> HEAT CRAMPS <input type="checkbox"/> CHILBLAIN <input type="checkbox"/> HEAT EXHAUSTION <input type="checkbox"/> FROSTBITE <input type="checkbox"/> HEAT STROKE <input type="checkbox"/> HYPOTHERMIA		TIME ON ACTIVE DUTY (Months)				
DESCRIBE BRIEFLY WHAT PATIENT WAS DOING AT TIME OF INJURY. INCLUDE DESCRIPTION OF CLOTHING								
NOTE: (1) ALL HEAT-STRESS INJURIES SHOULD HAVE RECTAL TEMPERATURES. (2) ALL HEAT-STRESS INJURIES WITH RECTAL TEMPERATURES GREATER THAN 104°F SHOULD HAVE SERUM SGOT DRAWN 24 HOURS AFTER THE INJURY					LAB FINDINGS			
SYMPTOMS (Check all applicable) <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> UNCONSCIOUSNESS  <input type="checkbox"/> DIZZY  <input type="checkbox"/> CONFUSED  <input type="checkbox"/> NUMBNESS  <input type="checkbox"/> VISUAL DISTURBANCES (Specify)             </div> <div style="width: 50%;"> <input type="checkbox"/> WEAK  <input type="checkbox"/> NAUSEA (Specify)  <input type="checkbox"/> CRAMPS  <input type="checkbox"/> VOMITING             </div> <div style="width: 50%;"> <input type="checkbox"/> OTHER  <input type="checkbox"/> PALE  <input type="checkbox"/> IV REQUIRED  <input type="checkbox"/> DRY  <input type="checkbox"/> RASH             </div> <div style="width: 50%;"> <input type="checkbox"/> RED  <input type="checkbox"/> OTHER  <input type="checkbox"/> WET             </div> </div>					TEMP (R)	RESP.		
					PULSE			
					HEIGHT			
					WEIGHT			
HOURS OF SLEEP (Last 24 Hours)	LAST MEAL (Date and time) AMOUNT <input type="checkbox"/> LIGHT <input type="checkbox"/> MODERATE <input type="checkbox"/> HEAVY			BLOOD PRESSURE SYSTOLIC _____ DIASTOLIC _____				
AMOUNT OF WATER IN QTS. (Last 12 Hours)	SWEATING (Check one) <input type="checkbox"/> EXCESS <input type="checkbox"/> MODERATE <input type="checkbox"/> NONE <input type="checkbox"/> SLIGHT							
LAST HISTORY OF HEAT/COLD ILLNESS (Specify type)								
DATE (MONTH AND DAY)		DIAGNOSIS NONE						
RECENT ILLNESS OR IMMUNIZATION								
DATE		DIAGNOSIS NONE						
DISPOSITION PRESENT ILLNESS			<input type="checkbox"/> BINNACLE LIST/SIQ (NUMBER OF DAYS)		<input type="checkbox"/> LIGHT DUTY (NUMBER OF DAYS)			
<input type="checkbox"/> CLINIC <input type="checkbox"/> HOSPITAL (Admitted)								
REMARKS (Initial treatment, long-term treatment potential, extent of injury, remission)								
SIGNATURE								
PREPARED			SUBMITTED COMMANDING OFFICER					

NAVMED 6500/1 (REV.5-99)  
 S/N0105-LF-015-080

Appendix B2-G

Enclosure (1)

FOR OFFICIAL USE ONLY (when filled in)

## CHAPTER B3

### HAZARDOUS MATERIAL CONTROL AND MANAGEMENT (HMC&M)

#### B0301. DISCUSSION

a. To attain and maintain operational effectiveness, Navy ships require specified types and quantities of hazardous material (HM). Great care must be taken in handling, using, and storing HM to prevent injury to personnel, damage to equipment, or harm to the environment. Risks associated with HM are greater aboard ship than ashore because of the limited number, confined nature, and "at sea" environment of shipboard spaces. Consequently, special precautions and an effective program to manage HM are both needed. The maintenance of safe and healthful working conditions for HM is a chain of command responsibility. Implementation begins with the commanding officer and extends to the individual sailor.

b. This chapter addresses general management requirements for HM. **Chapters C23 for surface ships and D15 for submarines contain specific management guidance and safety precautions** for the HM subcategories contained in the definition that follows. Commands having dental facilities shall refer to BUMEDINST 6260.30 for direction in implementing mercury control in affected spaces.

c. For submarines. This chapter and chapter D15 provide guidance for all HM, including HM that contains atmosphere contaminants per reference B3-1. Some of these contaminants may be released to the submarine atmosphere during operations involving the use of the HM. When a HM is a source of submarine atmospheric contamination, chapter D15 provides additional controls on the storage and use of this material.

d. The following definitions apply to Navy HMC&M:

(1) Hazardous Material (HM). Any material that, because of its quantity, concentration, or physical or chemical characteristics, may pose a substantial hazard to human health or the environment when incorrectly used, purposefully released, or accidentally spilled. Subcategories of HM include:

- (a) Flammable/combustible materials
- (b) Toxic materials
- (c) Corrosive materials (including acids and bases)
- (d) Oxidizing materials
- (e) Aerosol containers
- (f) Compressed gases

Not included in this definition are ammunition, weapons, explosives, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, pharmaceutical supplies (if not considered hazardous based on composition, physical form, and review of procedures which may involve the handling/dispensing of the materials), medical waste and infectious materials, bulk fuels, and radioactive materials. Even though the above items may not be considered HM, submarine atmosphere control requirements in chapter D15 may apply. Asbestos and lead require special guidance for handling and control, which are addressed in chapter B1 and B10 respectively.

- R) (2) **Hazardous Waste (HW)**. Any discarded, or intended to be discarded, material (liquid, solid, or gas) which meets the definition of HM and/or is designated as a hazardous waste by the Environmental Protection Agency or a State authority.

**NOTE:**

The Federal Facilities Compliance Act of 1992 states that any HW aboard an operational Navy ship is not subject to the storage, manifest, inspection, or recordkeeping requirements of the Resource Conservation and Recovery Act unless such waste is transferred to the ship within territorial waters of the U.S. and is stored on that ship for more than 90 days.

(3) **Used or Excess Hazardous Material (Used/Excess HM)**. HM for which there is no further, immediate use on board the ship possessing the material. Used HM is material that has been used in a shipboard process. Excess HM is unused material in full, properly sealed containers. Such material may ultimately be used on another ship, within the shore establishment, for a purpose other than that for which it was initially manufactured, or by commercial industry. Ships are required to transfer used or excess HM to a Navy shore activity for determination of suitability for further use. Navy shore activities possess trained personnel who can determine, working with ship's personnel, whether shipboard HM is usable, reusable, or should be disposed of as HW. The shore activity will act as the HW generator if it determines that the material has no further use and dispose of it as required by Federal, State, and local regulations.

**B0302. SURFACE SHIP HMC&M**

a. **Responsibilities**

(1) **The Commanding Officer shall:**

(a) Report to the Fleet Commanders by message, information to the chain of command, any conditions or system/equipment malfunctions that results in an overboard discharge of HM within restricted waters per reference B3-2 and applicable Operations Orders (OPORDs).

(b) Appoint a commissioned officer within the supply department as HM coordinator. On surface ships smaller than a frigate, appoint a commissioned officer as HM coordinator. Ships and afloat activities specifically designated by the Type Commander in which the number of assigned officers is limited and appointment would pose an excessive burden to the ship may assign a chief or leading petty officer as HM coordinator.

(2) **Division officers shall:**

(a) Ensure that NAVSEA-approved, in-space storage lockers are used.

R) (b) Ensure that HM retained within their workcenters is specific to the operations and maintenance of assigned equipment. If a Hazardous Material Minimization Center (HAZMINCEN) is in operation, no more than a 7-day supply of HM issued by the HAZMINCEN to the workcenter may be retained in workcenter spaces.

(c) Ensure used or excess HM issued by the HAZMINCEN is properly returned to the HM supervisor/HAZMINCEN.

(d) Ensure that approved personal protective clothing and equipment are available for HM operations or incidents and personnel are trained in their proper use and maintenance.

(e) Make personnel available to receive required HM training as detailed in section B0302e.

(f) Mark any PCB-containing electrical or electronic components per reference B3-3 and associated NAVSEASYSKOM-issued PCB advisories.

(3) **The safety officer shall** report all HM mishaps as required by chapter A6.

(4) **The afloat environmental protection coordinator (AEPC) shall** perform the functions described in reference B3-2.

(5) **The damage control assistant (DCA) shall:**

(a) Implement a spill contingency plan (SCP) per paragraph B0302c.

(b) Train and supervise ship's damage control teams (and fire department, if used aboard) in combating spills of HM.

(c) Provide training to divisions regarding reporting, initial handling, and cleanup of HM spills, as requested.

(d) Maintain the Hazardous Material Spill Response Kits (AEL 2-550024007).

(e) Ensure that HM spills are handled per appendix B3-A.

(6) **The supply officer/HM coordinator shall:**

(a) Ensure a Material Safety Data Sheet (MSDS) is on file (either hard copy or on CD-ROM) for all types and brands of HM taken aboard. Ensure that hard-copy MSDSs are readily accessible to personnel and their supervisors.

(b) Ensure only HM authorized for shipboard use by the Ship's Hazardous Material List (SHML) is requisitioned, or if necessary to do so, that a SHML Feedback Report (SFR) is promptly submitted.

(c) If an O-4 or below, obtain Commanding Officer's (or designated O-5's) written authorization prior to open purchasing any HM and that an SFR is promptly submitted.

(7) **The HM Supervisor shall:**

(a) Provide control and inventory management of designated ship's HM. For ships FFG and larger, manage the operation of the ship's HM minimization center (HAZMINCEN).

(b) Maintain the Hazardous Material Information System (HMIS) which contains MSDS information (see paragraph B0302d(2)). Retain hard copy MSDSs for locally purchased material and for materials not covered in the HMIS. Forward copies of MSDSs which are not on this system to: Commanding Officer, Navy Environmental Health Center, Attn: HMIS (Code 341), 2510 Walmer Avenue, Norfolk, VA 23513-2617.

(c) Ensure receipt and consolidation (as appropriate) of all used HM normally issued by the HAZMINCEN. Supervise document preparation for off-load of used/excess HM. Prior to the ship getting underway, ensure that no HM remains on the pier.

(d) Ensure personnel assigned to the HAZMINCEN (HAZMINCEN operator(s)) are trained on duties and responsibilities prior to assuming these duties.

(e) Ensure that when HM is transferred into other containers, the new containers are properly marked with the information specified in paragraph C2302e. The requirement to transfer HM into other containers shall be limited to HM which is specific to the division. Where possible, HM shall be obtained from the HAZMINCEN in containers sized to the user's need.

(8) **The Medical Department Representative (MDR) shall:**

(a) Assist the HM supervisor and work center supervisors in training personnel regarding health information and personal protective equipment requirements for the HM they are using.

(b) Maintain a complete MSDS file. This may be HMIS on CD-ROM or hardcopy.

(9) **Division supply petty officers (when there is no HAZMINCEN aboard or for HM specific to the division) shall** order only authorized material. Standard stock HM shall be used whenever possible to avoid procurement of open purchased HM. Submit an SFR whenever ordering HM not authorized by the SHML or during open purchase.

(10) **Workcenter supervisors shall:**

(a) Ensure that approved personal protective clothing and equipment are maintained and used.

(b) Ensure that prior to initial use or handling any HM, workcenter personnel have been trained on the hazards associated with that material and are familiar with what an MSDS is, what it contains, and where a copy is available for review. Learning resources for this training are available at <http://www.norva.navy.mil/navosh>.

(11) **All hands shall:**

(a) Return HM to approved stowage or the HAZMINCEN upon completion of use or at the end of the workday.

(b) Properly use and handle HM.

(c) Collect and segregate any residue resulting from use of HM issued from the HAZMINCEN for turn-in to the supply department/HAZMINCEN.

(d) Report any spills of HM to the Officer Of the Deck, and/or Damage Control Central/Central Control Station.

(e) Properly stow or return to the HAZMINCEN/supply department any HM found improperly stowed in work or berthing spaces.

(f) Report any violation of HM use, storage, and handling precautions to the supervisor.

(g) Ensure that when HM is transferred into other containers, the new containers are properly marked with the information specified in paragraph C2302e. The requirement to transfer HM into other containers shall be limited to HM specific to the division. Where possible, HM shall be obtained from the HAZMINCEN in containers sized to the user's need.

b. **Hazardous Material Control and Management Elements.** The following elements are essential for effective surface ship HM control and management:

- (1) Designation of adequate storage for HM (see chapters C23 and D15) (R)
- (2) Controlling HM purchase (including type and quantity of material required), receipt, and issue to avoid accumulation of excessive HM (see chapter C23)
- (3) Following approved safety standards for the use of HM (see chapters B1, B8, B10, and C23 for specific HM use requirements)
- (4) Reutilization of HM to reduce the amount of used HM generated (see chapter C23)
- (5) Collecting, segregating, and disposing of used or excess HM (see chapter C23)
- (6) Responding to HM emergencies (see B0302c)
- (7) Obtaining and providing MSDSs for on board HM (see chapter C23)
- (8) Training (see B0302e)
- (9) Proper labeling of HM (see chapter C23).

c. **HM Emergency Response.** The DCA shall use appendices B3-A and B3-B as HM spill response procedures in preparation for possible HM spills or releases to the environment. These plans include information on spill response team makeup, spill cleanup equipment location, internal and external spill reporting criteria, as well as procedures that are unique to the ship. Reporting requirements for a HM spill which goes over the side are found in reference B3-2, chapter 19. Appendix B3-B is specific to mercury.

d. **HM Information**

(1) **MSDS.** MSDSs are technical bulletins containing information about materials, such as composition, chemical, and physical characteristics, health and safety hazards, and precautions for safe handling, use, and disposal. MSDSs shall be maintained for every item of HM aboard either through the HMIS (see paragraph B0302d(2)) or by hard copy for open purchased items. They shall be readily accessible to supervisors and personnel who actually use or handle HM. Supervisors are required to provide instruction in MSDS understanding and use. All personnel using HM shall be trained on the dangers and precautions contained within the MSDS before they actually use those materials. (R)

(2) **Hazardous Material Control and Management (HMC&M) Compact Disc-Read Only Memory (CD-ROM).** The HMC&M CD-ROM is a Navy data application which contains the HMIS, Ships' Hazardous Material List (SHML), and the Shipboard Safety Equipment Shopping Guide. The HMIS is a compilation of MSDS data applicable to DOD. If a MSDS is not available for material provided to the ship for use, the HMIS shall be scanned to determine if such data are resident within it. Chapter C23 contains storage requirements and coding found on some items listed in HMIS. The HM supervisor shall maintain the HMIS. Ensure that only the most current version is used.

(3) Shipboard Safety Equipment Shopping Guide (NAVSAFECEN Publication). This publication consolidates standard stock numbers for safety equipment and personal protective equipment.

(4) Federal Logistics Data on Compact Disc (FEDLOG). This disc contains the Management List, Navy (MLN), which includes additional information on HM. The Special Material Content Code (SMCC) for NSNs used by the Navy can be found in the Management Control (MGT CTL) field. The SMCC Code is in the seventh position of that field.

(5) Hazardous Material Inventory Control System (HICS). HICS is a menu-driven inventory control system. It assists the operator in the systematic, positive control and issue of hazardous material. It has the following capabilities:

- (a) Prints bar-code control numbers for each item of HM issued.
- (b) Lists master HM inventory by type and location for use in determining HM on hand.
- (c) Tracks HM usage and containers issued to the department, division, workcenter, or individual level.
- (d) Produces receipts, inventory reports, and other customized reports.
- (e) Tracks inventory high and low stock level limits.
- (f) In conjunction with a scanner, allows remote site recording/tracking of returned containers or site inventory.

(6) CNO Policy Guide for Shipboard Hazardous Material Container Disposal (OPNAV Publication P-45-114-95). This publication provides guidance on the disposal of containers that formerly held HM. The guidance document provides a simple decision flow chart to assist the user in rapidly determining whether a HM container is an "empty container" and if it is, whether it may be disposed of as trash or as used HM.

e. HM Training

(1) The HM Coordinator shall normally receive en route training at the Navy Supply Corps School Basic and Department Head Courses. HM coordinators who are not Supply Corps officers shall attend the Afloat HM Coordinator Course (A-8B-0008) taught by the Naval Occupational Safety and Health and Environmental Training Center (NAVOSHENVTRACEN). The course shall be completed prior to, or within 6 months of, being assigned this duty.

(2) The HM Supervisor, and other assigned personnel as required by the activity manpower document, shall be a graduate of the HMC&M Technician (SNEC 9595) course (A-322-2600). If the ship has a HAZMINCEN, at a minimum the HM supervisor shall also be a graduate of the CHRIMP/HICS Technician course. Both courses are taught by the NAVOSHENVTRACEN.

(3) Damage control teams required to combat an emergency involving HM, and the ship's fire department (if used aboard) shall receive training on HM emergency procedures. The Damage Control Assistant shall ensure adequate training is provided and supervise ship's damage control efforts to combat HM spills. HM spill response drills shall be conducted as often as the DCA considers necessary.

(4) Audiovisual materials applicable to HM can be found in appendix A7-F.

**B0303. SUBMARINE HMC&M**

**a. Responsibilities**

**(1) The Commanding Officer shall:**

(a) Report all HM mishaps as required by chapter A6.

(b) Report to the Fleet Commanders by message, information to the chain of command, any conditions or system/equipment malfunctions that results in an overboard discharge of HM within restricted waters per reference B3-2 and applicable Operations Orders (OPORDs).

(c) Ensure that spills of HM are handled per the Ships System Manual (SSM) Toxic Gas Bill.

**(2) The executive officer shall:**

(a) Grant written permission to carry or use on board any restricted HM during an underway period. Refer to chapter D15 and reference B3-1 for definitions of submarine material control usage categories.

(b) Ensure assigned personnel follow the conditions under which restricted or limited HM are stored or used on board to minimize the release (off-gassing, mists, or vapors) of potential atmospheric contaminants into the submarine.

(c) Review the Submarine Material Control Log prior to each underway operation of 24 hours or greater, conducted in the recirculation mode, to ensure that restricted (R) items have been removed from the submarine.

**(3) Department heads shall:**

(a) Ensure that HM retained within their work centers is unique to the operations and maintenance of assigned equipment and does not exceed the quantity needed to satisfy operational requirements.

(b) Ensure used or excess HM is properly returned to the Supply Officer for turn over to the shore activity.

(c) Report all items found with a restricted (R) or limited (L) use code that have not been logged in the Submarine Material Control Log to the Supply Officer for logging, labeling, and assignment of approved storage location, or disposal. (R)

(d) Report all items found that are not listed (categorized) in the Submarine Material Control List (SMCL) to the Supply Officer. Items not listed in the SMCL are prohibited per paragraph D1502(a). (A)

(e) Obtain written permission from the executive officer to retain on board or use restricted items during underway operations.

(f) Ensure that restricted items authorized for in port use only are removed from the submarine as soon as the need for them no longer exists. Inform the Supply Officer of their removal to allow documentation in the Submarine Material Control Log.

(g) Ensure that all HM in their custody are used, handled, and stowed per the requirements of chapter D15.



(4) **The supply officer/HM coordinator shall:**

(a) Ensure that management of shipboard HM follows procedures outlined in this chapter and chapter D15.

R) (b) Ensure an MSDS is on file (either hard copy or on CD-ROM) for all types and brands of HM taken aboard. Ensure that hard-copy MSDSs are readily accessible to personnel and their supervisors. Maintain the Submarine Hazardous Material Inventory and Management System (SHIMS) which contains MSDS information as outlined in paragraph B0303d(1)). Retain hard copies of MSDSs which are not on the SHIMS system to Naval Surface Warfare Center, Carderock Division, Code 632.

(c) Ensure no prohibited HM is brought on board.

(d) Maintain the Submarine Material Control Log per paragraph D1502d.

R) (e) Ensure all HM brought on board is authorized for storage and use onboard by the Submarine Material Control List (SMCL). Affix an Atmosphere Contaminant Tag (Appendix D15-C) for any material that is a restricted (R) or limited (L) HM.

(f) Initiate an investigation of any item suspected of being an atmosphere contaminant per the procedures of reference B3-1 and submit a SMCL feedback report per chapter D-15.

(g) Ensure that all restricted (R) and limited (L) items are inventoried every 6 months or prior to a change of command.

(h) Review the Submarine Material Control Log weekly in port and monthly underway.

(i) Obtain commanding officer's written authorization prior to open purchasing any HM.

(5) **The MDR shall:**

(a) Assist work center supervisors in training personnel regarding health information and personal protective equipment requirements for the HM they are using.

R) (b) Provide medical assistance in the event of a HM spill or mishap involving HM. Use MSDS information in SHIMS provided by the Supply Officer.

(6) **Division Officers shall:**

(a) Ensure when HM is transferred into other containers the new containers are properly marked with the information specified in paragraph D1502d.

(b) Ensure approved personal protective clothing and equipment are available for HM operations or incidents and personnel are trained in their proper use and maintenance.

(c) Ensure personnel are made available to receive required HM training as detailed in section B0303e.

(d) Mark any PCB-containing electrical or electronic components per chapter D15.

(7) **The Damage Control Assistant shall:**

(a) Train and supervise ship's damage control efforts to combat HM spills. Conduct HM spill response drills as necessary.

(b) Provide training to divisions regarding reporting, initial handling, and cleanup of HM spills, as requested.

(c) Maintain an OTTO FUEL spill kit (AEL A006350027) to respond to HM emergencies.

(d) Hazardous material emergency response shall be conducted per the Toxic Gas Bill. The DCA shall follow the Toxic Gas Bill in preparation for possible HM spills or releases to the environment. Reporting requirements for a HM spill which goes over the side are found in reference B3-2, chapter 19.

(8) Repair parts petty officers shall ensure before HM is ordered, that a valid requirement (specifically required by a maintenance procedure or other shipboard operation) exists. Standard stock HM shall be used whenever possible to avoid procurement of open purchased HM.

(9) Workcenter supervisors shall:

(a) Ensure that approved personal protective clothing and equipment are maintained and utilized.

(b) Ensure that prior to using or handling any HM, workcenter personnel have been trained on the hazards associated with that material and are familiar with what an MSDS is, what it contains, and where a copy is available for review.

(c) Ensure that a valid maintenance requirement exists for any HM item not listed in the SMCL and initiate a SMCL feedback report.

(10) All hands shall:

(a) Ensure that HM is returned to appropriate stowage upon completion of use or at the end of the workday, whichever is earlier.

(b) Follow instructions provided for the proper use of HM.

(c) Collect and segregate any used HM for proper offload per chapter D15.

(d) Report any spills of HM to the Duty Officer (in port) or the Chief Of the Watch (underway).

(e) Report any violation of HM use, storage, and handling precautions to the supervisor for resolution/correction.

(f) Be alert to prevent the onboard storage and use of restricted material during underway operations without prior approval/authorization from the Executive Officer. Ensure limited material is being used per SMCL guidance. (R)

b. Hazardous Material Control and Management Elements. The following elements are essential for effective submarine HM control and management:

(1) Proper use of HM per SMCL guidance (see chapter D15)

(2) Designation of adequate storage for HM (see chapter D15)

(3) Controlling HM purchase (including type and quantity of material required), receipt, and issue to avoid accumulation of excessive HM (see chapter D15)

- (4) Avoiding open purchases of HM (see chapter D15)
- (5) Following approved safety standards for the use of HM (see chapters B1, B3, B10 and D15 for specific requirements on use of HM)
- (6) Reutilization of HM to reduce the amount of used HM generated (see chapter D15)
- (7) Collection, segregation, and disposal of used or excess HM (see chapter D15)
- (8) Responding to HM emergencies (see B0303c)
- (9) Obtaining and providing MSDSs for on board HM (see chapter D15)
- (10) Training (see B0303e)
- (11) Proper HM labeling (see chapter D15)

c. **HM Emergency Response.** Hazardous material emergency response shall be conducted per the Toxic Gas Bill. The DCA shall follow the Toxic Gas Bill in preparation for possible HM spills or releases to the environment. Reporting requirements for a HM spill which goes over the side are found in reference B3-2, chapter 19.

d. **HM Information**

- A) (1) **The Submarine Hazardous Material Inventory and Management System (SHIMS).** SHIMS is a menu driven HM inventory and management tool for use aboard submarines. SHIMS allows submarines to be in full compliance with this instruction.. It assists the operator in the systematic, positive control and management of HM. SHIMS provides:
- (a.) A standardized tool to assist in submarine HMC&M compliance, inventory management, and shelf-life management;
  - (b.) A standardized tool to implement submarine atmospheric control requirements;
  - (c.) A single data source for SMCL and MSDS information;
  - (d.) Standard reports, references and output that meet requirements of this instruction and references B3-1, B3-2 and B3-4.
- (2) **MSDS.** MSDSs are technical bulletins containing information about materials, such as composition, chemical, and physical characteristics, health and safety hazards, and precautions for safe handling, use, and disposal. MSDSs shall be maintained for every HM item aboard either through SHIMS or by hard copy for open purchased items. They shall be readily accessible to supervisors and personnel who actually use or handle HM. Supervisors are required to provide instruction in MSDS understanding and use. All personnel using HM shall be trained on the dangers and precautions contained within the MSDS before they actually use those materials.
- R) (3) **Hazardous Material Control and Management (HMC&M) Compact Disc-Read Only Memory (CD-ROM).** The HMC&M CD-ROM is a Navy data application which contains the HMIS, SHML, and the Shipboard Safety Equipment Shopping Guide. The HMIS is a compilation of MSDS data applicable to DOD. If a MSDS is not available for material provided to the ship for use, the HMIS shall be scanned to determine if such data are resident within it. The supply officer shall

maintain the HMIS. Ensure that only the most current version is used.

(4) CNO Policy Guide for Shipboard Hazardous Material Container Disposal (OPNAV Publication P-45-114-95). This publication provides guidance on the disposal of containers that formerly held HM. The guidance document provides a simple decision flow chart to assist the user in rapidly determining whether a HM container is an "empty container" and if it is, whether it may be disposed of as trash or as used HM.

(R)

(5) The Submarine Material Control List (SMCL). The SMCL is a Navy data application that lists the authorized HM for use on submarines as established by reference B3-1.

(R)

e. Training

(1) The HM coordinator receives en route training at the Navy Supply Corps School Basic Course (A-8B-0008).

(2) The leading SK shall be a graduate of the HMC&M Technician (SNEC 9595) course (A-322-2600).

(3) Personnel expected to combat an emergency involving HM shall receive training on HM emergency procedures.

(4) Audiovisual materials applicable to HM can be found in appendix A7-F.

---

CHAPTER B3

REFERENCES

- |      |  |
|------|--|
| B3-1 | NAVSEA Manual S9510-AB-ATM-010(U), Nuclear Submarine Atmosphere Control Manual (NOTAL) |
| B3-2 | OPNAVINST 5090.1B, Environmental and Natural Resources Program Manual (NOTAL)          |
| B3-3 | NAVSEA S593-A1-MAN-010, Shipboard Management Guide to PCBs (NOTAL)                     |
| B3-4 | Submarine Supply Procedures Manual, COMSUBLANT/COMSUBPACINST 4406.1E.                  |

(A)

**Appendix B3-A**

**HAZARDOUS MATERIAL SPILL RESPONSE PROCEDURES (SURFACE SHIPS ONLY)**

1. **Introduction.** Because of the extremely hazardous nature of many materials used aboard ships, only trained personnel shall respond to a hazardous material (HM) spill. Personnel shall be trained by division officers or supervisory personnel to clean up small spills of HM. Appropriate Material Safety Data Sheets (MSDSs) shall be used to conduct training.

Response procedures for many specific situations are provided in other documents. See Naval Warfare Publication (NWP) 62-1, Surface Ship Survivability for repair party responsibilities. See Naval Ships Technical Manual (NSTM) 555 for shipboard HM fire fighting procedures; NSTM chapter 079, Volume 2 for HM damage control procedures; and NSTM chapter 077 for personal protective equipment guidance. See NAVAIR 00-80-R-14 for aircraft HM fire fighting procedures. These spill procedures apply to on board HM spills. Response for HM and oil spills over-the-side is contained in reference B3-2.

For descriptive purposes, the spill response procedures have been divided into nine phases:

- a. Discovery and Notification.
- b. Initiation of Action.
- c. Evaluation.
- d. Containment and Damage Control.
- e. Dispersion of Gases/Vapors.
- f. Cleanup and Decontamination.
- g. Disposal of Contaminated Materials.
- h. Certification for Re-entry.
- i. Follow-up Reports.

Each response phase is **not** a separate response action entirely independent of all other phases. Several phases may occur simultaneously and may involve common elements in their operation. For example, containment and damage control may also involve cleanup and disposal techniques.

**2. Spill Discovery and Notification**

a. Spills or potential spills of HM may be discovered by regularly scheduled inspections of storerooms and workshops, by detection devices such as fire alarms and oxygen deficiency detectors, and during routine operations. All discoveries of spills or situations that may lead to a spill must be verbally reported **immediately** to supervisory personnel and the officer of the deck (OOD)/command duty officer (CDO). Crewmembers are **not** to remain in the area to investigate the spill. Whenever possible, however, the discoverer /initial response team shall report the following information:

- (1) Time of spill discovery.
- (2) Location of spill.
- (3) Identification of spilled material.
- (4) Behavior of material (reactions observed).
- (5) Source of spill (e.g., tank or container).
- (6) Personnel in vicinity of spill (list by name and department).
- (7) Volume of spill.

(8) Anticipated movement of spill (e.g., leakage to lower deck passage from amidships toward galley).

(9) Labeling or placarding information (copy data from spilled container only after exposure to spill is eliminated).

b. Overboard spills of reportable quantities of HM shall be reported per reference B3-2.

3. **Initiation of Action.** Coordination and direction of spill response efforts at the scene of an HM spill shall be accomplished by the ship's OOD, CDO, fire chief, damage control party leader, or senior person at the scene, as appropriate, who shall initiate the following actions:

a. Evacuate all personnel from areas that may be exposed to the spilled material.

b. Cordon off the affected area.

c. Arrange first aid for injured personnel.

**CAUTION:**

**Do not enter the contaminated area until the necessary protective clothing and equipment have been determined.**

d. Establish a command post and communications network.

e. Prevent spills from entering other compartments by any means that do not involve personnel exposure to the spill, such as closing drains, ventilation ducts, doors, and hatches.

f. Disperse gases or vapors to weather using blow-out (forced exhaust) ventilation or by natural ventilation such as opening doors or hatches. If atmosphere is suspected to be flammable or explosive, only explosion-proof fans shall be used for blow-out ventilation.

g. Eliminate any fire or explosion hazards such as electrical equipment, incompatible materials, and open flames.

4. **Evaluation.** Proper evaluation of a spill can prevent fires, explosions, personal injury, or permit steps to lessen their impact. This evaluation consists of the following three steps:

a. Obtain as much of the following information as possible from container labels and MSDS before starting response actions:

- (1) Type and concentration of the spilled material.
- (2) Hazardous characteristics of the spilled material, such as:
  - (a) Flash Point
  - (b) Toxicity
  - (c) Corrosiveness
  - (d) Potentially incompatible substances
  - (e) Effects resulting from exposure (fainting, dizziness, skin or eye irritation, nausea)
  - (f) First aid measures for exposure

b. Determine dangerous conditions or potential consequences of the spill, including:

- (1) Fire or explosion.
- (2) Presence of oxygen-deficient atmosphere in compartment.
- (3) Presence of toxic or explosive gases.
- (4) Possibility of dangerous vapors being drawn into ship's ventilating system.
- (5) Other HM in the compartment that would play a role in a fire or explosion or is incompatible with the spilled material.

c. Determine from the MSDS the appropriate spill response equipment and protective clothing necessary for safe and effective response.

5. **Containment and Damage Control**. Actions taken during this phase are directed toward controlling the immediate spread of the spill and minimizing the impact to the ship and crew. Depending on the type of spill, some or all of the following procedures may be employed:

a. Fight fire (if any), being careful to use fire fighting methods compatible with the material involved. Fire fighting procedures are provided in NSTM chapter 555, "Fire Fighting, Ships."

b. Shut off or otherwise stem the spill at its source, whenever feasible, by:

- (1) Replacing leaking containers.
- (2) Plugging leaks in tanks.
- (3) Emptying tank of remaining contents.
- (4) Encapsulating a leaking container into a larger, liquid-tight container.

(5) Segregating leaking containers.

c. Predict spill movement and take further action to prevent the spill from possibly entering other compartments by closing scuppers, drains, ventilation ducts, doors, or hatches.

d. Contain liquid material using barriers, such as sand, upholstery, sorbents, or other equipment suitable to dam the flow.

6. **Dispersion of Gas/Vapor.** If a flammable gas or vapor is released as a result of the spill, the gas/vapor shall be dispersed or diluted as soon as possible. The gas/vapor shall not be allowed to enter other compartments. In some cases, the explosive atmosphere shall be contained and diluted to lower its concentration below the Lower Explosive Limit (LEL). Have the gas free engineer check the spill area for LEL and toxicity. The atmosphere can then be dispersed by one of the following methods:

a. Normal exhaust ventilation (explosion-proof only).

b. Blow-out ventilation (powerful exhaust ventilation provided in some HM storerooms--explosion-proof only).

c. Doors and hatches open to the weather.

d. Portable fans (explosion-proof only).

7. **Cleanup and Decontamination.** During this response phase, personnel, as directed by the person in charge, shall employ the spill cleanup methods recommended on the MSDS or, in the case of a mercury spill, those outlined in appendix B3-B. All surfaces shall be thoroughly cleaned of the spilled material. After the spill cleanup, the compartment shall be thoroughly ventilated. Reusable protective clothing shall be thoroughly decontaminated and otherwise maintained before it is returned to its proper storage location.

**NOTE:**

Identification of specific requirements for respiratory protection and proper use of this equipment is a critical aspect of all cleanup and decontamination operations.

8. **Disposal of Contaminated Materials.** All non-reusable cleanup materials are to be placed in impermeable containers, stored and disposed of as hazardous waste per appendix L of reference B3-2. These materials include unrecoverable protective clothing, sorbents, rags, brooms, and containers.

9. **Certification for Safe Re-Entry.** The spaces affected by the spill shall be certified safe by the OOD/CDO before normal shipboard operations are resumed in that space. The OOD/CDO shall ascertain the following before allowing re-entry:

a. All surfaces--deck, counters, bulkheads, and overheads--have been thoroughly cleaned of the spilled material.

b. All compartments have been adequately ventilated as determined from analysis by the gas free engineer.



c. All contaminated cleanup materials, including protective clothing, have been packaged, marked and handled as used HM.

10. **Follow-up Reports.** The OOD/CDO shall submit to the HM coordinator a spill report for all on board spills. A copy of this report shall be filed by the safety officer and shall contain the following information:

- a. Date spill occurred.
- b. Spill location.
- c. Identity of spilled material.
- d. Cause(s) of spill.
- e. Damage or injuries resulting from the spill.
- f. Response and cleanup measures taken.
- g. Any problems encountered.
- h. Method of disposing of contaminated material.
- i. Action taken to prevent the repeat of a similar spill.

Appendix B3-B

**MERCURY SPILL RESPONSE AND CLEANUP PROCEDURES (SURFACE SHIPS ONLY)**

1. **Mercury Spill Cleanup Procedures.** Procedures shall vary according to the size and complexity of the spill.

a. **Broken Fluorescent Bulbs**

- (1) Set up local exhaust ventilation.
- (2) Carefully sweep up bulb debris and double bag for disposal as HM.
- (3) Clean the area with a solution of HgX decontaminant from mercury spill kit.

b. **Small Spills:** Clean mercury spills with 50 grams (3/4 teaspoon or quarter size) or less immediately as follows:

(1) If spill is in a confined area, set up local exhaust ventilation. If ventilation cannot be provided, a suitable respirator should be worn.

(2) Spill cleanup personnel shall not eat, drink, smoke or apply cosmetics in spill area. They shall wash thoroughly with soap and water after cleanup.

(3) Apply absorbent material from mercury spill kit to spilled mercury and dispose as HM.

(4) Wipe down spill area with HgX solution from spill kit.

(5) Discard any contaminated materials and protective clothing and dispose as HM.

c. **Large Spills:** Clean mercury spills of more than 50 grams (3/4 teaspoon or quarter size) immediately as follows:

(1) Stop work operations in the area.

(2) Warn personnel of the spill and its location, evacuate the area and establish safe boundaries.

(3) Call the mercury spill team.

(4) Use a mercury vapor meter to determine mercury vapor and degree of hazard, if possible.

(5) Apply absorbent material from mercury spill kit to spilled mercury and dispose as HM.

(6) Wipe down spill area with HgX solution from spill kit.

(7) Discard any contaminated materials and protective clothing and dispose as HM.

(8) Use a mercury vapor meter to detect any residual mercury. Re-clean with HgX if mercury vapor concentration exceeds 0.05 mg/m3.

(9) Use the mercury vapor meter after 24 hours to determine mercury vapor concentration. An allowable concentration of <0.01 mg/m<sup>3</sup> must be attained in any space to be continually occupied by an individual for 8 or more hours daily.

2. **Mercury Waste Disposal.** Mercury is an environmental pollutant and must not be discharged into any body of water or released into any ship's waste disposal system. Disposal should be coordinated with the HM Coordinator and shore facility.

## CHAPTER B4

### HEARING CONSERVATION

#### **B0401. DISCUSSION**

The goal of Hearing Conservation (HC) is to prevent occupational hearing loss and assure auditory fitness for duty of all Navy personnel.

Noise-induced hearing loss is the Fleet's number one occupational health hazard. High intensity noise exposure results from a wide variety of shipboard operations, including gun or missile fire, aircraft noise, and ship's propulsion systems. Operational risk assessment has shown that Fleet costs in terms of man hours, personal hearing protector purchases, and noise abatement operations are readily offset by the preservation of effective communication, maintained quality of life, and reduction in disability expense which accompany an effective HC process. As such, it is incumbent upon leadership to set the right example in their personal protective practices, to enforce compliance, and to ensure HC receives their full support.

#### **B0402. HEARING CONSERVATION RESPONSIBILITIES**

a. **The commanding officer shall** ensure that HC is established and maintained within the command.

b. **The safety officer shall:**

(1) Request assistance from an industrial hygienist or occupational audiologist to conduct noise measurement and exposure analysis (survey) of areas and equipment per paragraph B0404.

(2) Maintain a record of noise hazardous areas and equipment. The baseline or subsequent industrial hygiene surveys, where available, shall serve as documentation. Ensure that noise hazardous spaces/equipment are posted and labeled accordingly.

(3) Ensure that all permanent threshold shifts reported by medical department are logged. This log shall be periodically reviewed to determine any trends that could indicate inadequate use of hearing protection or uncontrolled overexposure to excessive noise levels.

c. **Industrial hygiene officers shall:**

(1) Maintain and ensure proper calibration of sound level measuring equipment.

(2) Annually, certify audiometric testing booths installed aboard the ships.

d. **Division officers shall:**

(1) Ensure personnel exposed to hazardous noise have and properly use hearing protection devices.

(2) Ensure that a space or piece of equipment that is designated as noise hazardous is properly posted and labeled.

(3) Ensure all personnel required to wear personal hearing protection are trained in the use and maintenance of that protective equipment, regardless of whether they require enrollment in HC.

(4) Ensure personnel report for scheduled audiometric testing and training.

(5) Ensure that personnel who require hearing retests are excluded from hazardous noise for at least 14 hours before the scheduled test date/time. Per appendix B4-A, hearing protective devices may not be used to meet this requirement.

(6) Coordinate with the medical department representative to identify personnel routinely exposed to hazardous levels of occupational noise.

e. **The Medical Department Representative (MDR) shall:**

(1) Coordinate with division officers to identify and maintain a current roster of personnel routinely exposed to hazardous levels of occupational noise, as guided by the baseline or other industrial hygiene surveys. In the absence of an appropriate industrial hygiene survey, or when it is clear that personnel have some level of exposure to hazardous noise, but on an infrequent or short-term basis, consult an industrial hygienist, occupational audiologist, or occupational medicine physician to determine the need for enrollment. The consultation may be informal (example, by email) as long as a printed record of the request and reply are available for retention by both parties. Convenience shall not be a criteria to determine inclusion in HC.

(2) Conduct orientation to HC and personal hearing protection for all hands during indoctrination.

(3) Ensure annual refresher training, per B0408b for the HC-enrolled personnel is performed. Reference B4-1 identifies suitable training materials and provides additional guidance.

(4) Consult the command industrial hygiene survey, or an occupational health professional to determine the type of required hearing protective devices required for personnel. Maintain an adequate stock and fit all sized, non-disposable hearing protective devices.

(5) Schedule personnel in HC for annual audiometric testing. Ensure that monitoring results have been entered into each individual's health record, and that any necessary follow-up actions are completed.

(6) Ensure supervisors are notified that personnel who require hearing re-tests are excluded from hazardous noise duties for at least 14 hours prior to the scheduled test date/time. Hearing protective devices may not be used to meet this requirement.

(7) If audiometric testing is performed within the MDR's command, ensure calibration of audiometers, certification of the test chamber, and training of audiometric technicians.

**NOTE:**

Reference B4-1 is available for additional information.

(8) Report all permanent threshold shifts toward deteriorated hearing, which have been determined to be consistent with occupational origin, to the safety officer. Report must include name, rate or rank, workcenter and time onboard.

f. **All hands shall:**

(1) Comply with hazardous noise labels wherever they appear, either in spaces or on equipment, and properly wear assigned hearing protective devices.

(2) Undergo hearing testing when designated.

**B0403. HEARING CONSERVATION ELEMENTS**

Hearing conservation includes the following elements:

a. Noise measurement and exposure analysis to identify hazardous noise areas or sources and the personnel exposed

b. Application of engineering controls to reduce hazardous noise to the maximum extent feasible

c. Use of hearing protective devices as an interim measure where engineering controls are not feasible (paragraph B0406)

d. Periodic hearing testing of all personnel at risk to monitor the effectiveness of the process, and timely audiologic and medical evaluation of those personnel who demonstrate significant hearing loss or threshold shift (paragraph B0407)

e. Training regarding potentially hazardous noise areas and sources, use and care of hearing protective devices, the effects of noise on hearing, and the command's HC process (paragraph B0408).

**B0404. NOISE MEASUREMENT AND EXPOSURE ASSESSMENT**

To effectively control noise, it is necessary that the noise be accurately measured according to standard procedures and that the measurements be properly evaluated against accepted criteria.

a. **Noise Measurements.** Noise measurements shall be taken as part of the industrial hygiene survey described in chapter A3 of this instruction. A noise survey is required if one has not been performed, if the ship has completed a repair availability with significant work done on engineering systems, or if new equipment has been installed. These measurements shall be taken by an industrial hygienist, occupational audiologist or by other trained personnel under the supervision of an industrial hygienist or occupational audiologist. Detailed information on noise measurements may be found in appendix B4-A. The safety officer shall retain a copy of noise measurement data per B0409.

b. **Exposure Assessment**

(1) The analysis of noise measurements to assess the hazard potential is a complex task that shall be performed by an industrial hygienist or occupational audiologist. The exposure assessment shall be accomplished per reference B4-2.

(2) The criteria outlined in appendices B4-A and B4-B shall also be used to determine the degree of compliance with applicable standards.

(3) In the absence of an industrial hygienist's or occupational audiologist's assessment to the contrary, personnel who routinely work in noise

hazardous areas or with equipment that produces hazardous noise as defined in appendix B4-A, shall be included in HC. Implementation of all available measures may not be necessary in every case. For example, visitors to a noise hazardous area should be required to wear hearing protective equipment, but would not be required to have their hearing tested or be included on a roster of noise-exposed personnel. See appendix B4-A for additional information.

(4) Information regarding removal of personnel from HC is provided in Appendix B4-A.

c. Labeling of Hazardous Noise Areas and Equipment

(1) Designated hazardous noise areas and equipment that produce hazardous sound levels (see appendix B4-A) shall be appropriately labeled. NAVMED 6260/2, Hazardous Noise Warning Decal (8" x 10") NSN 0105-LF-004-7200 and the NAVMED 6260/2A, Hazardous Noise Labels (2" x 2") NSN 0105-LF-004-7800, or their equivalents, are approved for marking hazardous noise areas and equipment.

(2) Normally the outside of doors/hatches leading into a noise hazardous area shall be posted. However, weather surfaces of a ship shall not be posted. In the event that a particular area is a noise hazardous area and has an entrance from a weather deck, the inside of the weather deck door/hatch shall be posted.

(3) Exteriors of military combatant equipment are excluded from this labeling requirement. However, personnel operating and maintaining combat equipment must be made fully aware of hazardous noise exposure conditions.

**B0405. NOISE ABATEMENT**

a. Reduction of noise at the source is in the best interests of the Navy and its personnel. Areas and equipment that contain or produce potentially hazardous noise should be modified to reduce noise levels to within acceptable limits wherever it is technologically and operationally feasible.

b. Noise abatement actions will normally be accomplished during ship or equipment design, construction or testing. Hazardous noise areas/equipment not identified during construction or post overhaul noise surveys are most likely due to malfunctioning equipment. Noise abatement actions recommended by the industrial hygienist or resulting from Board of Inspection and Survey (INSURV) inspections shall be documented as required in chapter A4 of this instruction, and implemented as soon as possible.

c. Additional information on noise abatement is available in appendix B4-C.

**B0406. PERSONAL HEARING PROTECTIVE DEVICES**

a. Personnel working in or entering designated hazardous noise areas or utilizing noise hazardous tools or equipment shall have hearing protective devices available at all times, and wear them without consideration of the duration of the exposure. Exceptions to this requirement must be documented by a qualified professional.

b. A combination of insert type and circumaural (muff) type hearing protective devices (double protection) shall be worn:

(1) In all areas where sound levels exceed 104 dB(A), unless an occupational audiologist, industrial hygienist, or occupational medicine physician

has determined that single protection is adequate for the anticipated duration of the exposure.

(2) When a medical officer or audiologist determines that double protection is required.

c. All personnel exposed to gunfire in a training situation or to noise from large caliber gun or missile firing, under any circumstances, shall wear sufficient hearing protective devices to reduce noise at the ear to safe exposure levels.

d. Assistance in the determination of which hearing protective device, or combination of devices, suitable for use in each situation, is available from an occupational audiologist, industrial hygienist, or occupational medicine physician. Every effort shall be made to issue personal hearing protective devices suited to the location and duration of usage following the guidance contained in Appendix B4-D. Appendix B4-D identifies standard stock hearing protective devices. Alternative hearing protective devices that have been evaluated and approved by one of the Military Services are identified on the Navy Environmental Health Center (NEHC) homepage at <http://www.nehc.med.-navy.mil>.

e. For situations requiring unique hearing protection devices, guidance and approval shall be requested from Chief, Bureau of Medicine and Surgery (BUMED).

f. In cases where an industrial hygienist, occupational medicine physician or occupational audiologist determines that hearing protective devices do not provide sufficient attenuation to reduce the individual's effective exposure level to below 84 dB(A), administrative controls as discussed in appendices B4-B and B4-C will be required.

#### **B0407. HEARING TESTING AND MEDICAL EVALUATION**

Personnel who are routinely required to work in designated noise hazardous areas or with labeled noise hazardous equipment shall be entered into HC. Appendix B4-A provides detailed information on hearing testing.

a. **Reference (Baseline) Hearing Tests.** All personnel shall receive a baseline hearing test upon entry into naval service recorded on a Reference Audiogram (DD Form 2215). Hearing tests performed at Military Entrance Processing Stations (MEPS) shall not be used as a baseline hearing test.

b. **Monitoring Hearing Tests.** All personnel assigned to duties in designated noise hazardous areas or operating noise hazardous equipment shall be included in HC. These persons shall receive a hearing test annually, unless their exposure has been found to be of insufficient intensity and/or duration to require enrollment, based on a noise survey or the written opinion of an appropriate occupational health professional. Test results shall be recorded on a Hearing Conservation Data Form (Form DD 2216). Placement in HC and annual hearing tests shall continue for as long as the person remains in a noise hazardous environment.

c. **Termination Hearing Tests.** Personnel shall receive a hearing test upon termination of service.

d. **Other Hearing Tests.** Hearing tests performed for reasons other than hearing conservation or routine physicals, such as complaints of hearing difficulties, difficulty understanding conversational speech or a sensation of ringing or fullness in the ear(s), shall be performed as indicated by a Medi



cal Provider. The results of these tests should be recorded on a Standard Form (SF 600) and maintained in the health record.

**B0408. TRAINING**

a. All personnel included in HC shall receive training relative to HC prior to working in noise hazardous areas or with noise hazardous equipment and annually thereafter. Initial training topics shall include:

- (1) The elements and rationale for HC including the effects of noise on hearing
- (2) Designated noise hazardous areas and equipment
- (3) Proper use and maintenance of hearing protective devices, including the advantages and disadvantages of each type of device
- (4) The necessity for periodic hearing testing, and a description of test procedures
- (5) Mandatory requirement to wear assigned protective equipment, and administrative actions that may result from failure to comply
- (6) Off-duty hearing health hazards
- (7) The effects of hearing loss on career longevity, promotion and retention.

b. Refresher training for the HC-enrolled personnel will be performed in conjunction with the annual audiogram. Reference B4-1 identifies suitable training materials and provides additional guidance.

**B0409. RECORDKEEPING**

a. Results of hearing tests performed for hearing conservation purposes and the results of exposure assessments shall be permanently recorded and retained in the member's health record. Baseline and reference audiograms which have been superceded as a result of the follow-up process shall be retained in the individual's health record along with relevant evaluation, disposition and referral notations.

b. Activities using the Defense Occupational Health Readiness System-Hearing Conservation (DOHRS-HC) will upload their data to the warehouse as directed by the regional occupational audiologist. Activities that do not use DOHRS-HC should contact NAVENVIRHLTHCEN for guidance in including test data in the Hearing Conservation Database.

c. The MDR shall maintain a current roster of personnel who routinely work in designated noise hazardous areas and shall update this roster semi-annually. The MDR shall maintain a "tickler file" for scheduling annual audiometric examinations of these personnel. The MDR shall update the "tickler file" monthly with the results of the audiometric exams.

---

**CHAPTER B4**

**REFERENCES**

- B4-1 NEHC Technical Manual, TM-6260.51.99-1, Navy Medical Department Hearing Conservation Program Procedures (NOTAL)
- B4-2 NEHC Technical Manual, TM-6290.91-2, Rev. B (1999), Industrial Hygiene Field Operations Manual (NOTAL)
- B4-3 American National Standard Specification for Sound Level Meters, S1.4A-1985, American National Standards Institute (NOTAL -- Should be held by commands with sound level meters).
- B4-4 American National Standard Specification for Personal Noise Dosimeters, S1.25-1991, American National Standards Institute (NOTAL -- Should be held by commands with personal noise dosimeters).
- B4-5 DODINST 6055.12 of 22 April 1996, "DOD Hearing Conservation Program (HCP)" (NOTAL)
- B4-6 American National Standard Specification for Audiometers, S3.6-1989, American National Standards Institute (NOTAL -- Should be held by commands with audiometers).
- B4-7 OPNAVINST 4720.2G, "Fleet Modernization Program Policy".

**Appendix B4-A**

**HEARING CONSERVATION DETAILED INFORMATION**

This appendix provides detailed information regarding hearing conservation that will be of value to the ship's Medical and Safety Departments.

1. **Navy Occupational Exposure Level (NOEL).** The NOEL for occupational exposure to noise is listed below:

a. For an 8-hour time-weighted average (TWA) in any 24-hour period: 84 dB(A)

b. For periods of less than 16 hours in any 24-hour period, the NOEL can be determined from the following equation:

$$T = 16/2 [(L - 80)/4]$$

Where: T = time in hours (decimal)

L = effective sound level in dB(A)

**NOTE:**

When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect must be considered. If the sum of the following expression exceeds unity, then the mixed exposure exceeds the NOEL:

$$C1/T1 + C2/T2 + \dots Cn/Tn$$

Where C indicates the total time of exposure at a specified noise level and T represents the time of exposure permitted at that level.

c. For impact or impulse noise - 140 dB(A) peak sound pressure level.

d. When TWA exposures are likely to exceed 84 dB(A), then personnel shall be included in Hearing Conservation.

2. **Noise Measurements and Exposure Assessments.** To effectively control noise it is necessary to accurately measure noise according to standard procedures and properly evaluate the measurements against accepted criteria.

a. **Noise Measurements.** Noise measurements shall be taken as a part of the industrial hygiene survey described in chapter A3.

(1) Sound level meters shall conform, at a minimum, to the Type II requirements cited in reference B4-3. An acoustical calibrator, accurate to within plus or minus one decibel, shall be used to calibrate the instrument before each survey and to revalidate the calibration at the conclusion of the survey. The sound level meter and acoustical calibrator will be electroacoustically calibrated annually. Contact NAVENVIRHLTHCEN Norfolk to schedule the calibration of this equipment.

(a) Continuous or intermittent steady state noise shall be measured in dB(A) with a sound level meter set for slow response. Whenever levels in excess of 84 dB(A) are recorded, C-weighted measurements, dB(C) shall also

be taken to permit more accurate determination of hearing protector attenuation requirements.

(b) Impact or impulse noise shall be measured as dB peak sound pressure level (reference: 20  $\mu$ Pa) with an instrument capable of accurate impact noise measurement. Reference B4-3 provides specific details.

(2) In cases where high worker mobility, significant variations in sound levels, or a significant component of impulse noise make area monitoring generally inappropriate, personal dosimetry shall be conducted. Personal noise dosimeters shall meet the class 2A-84/80-4 requirements of reference B4-4 and have an operating range of at least 80 dB(A) to 130 dB(A).

(3) Work environments found to have noise levels greater than 84 dB(A) (continuous or intermittent), or 140 dB peak sound pressure level for impact or impulse noise shall be analyzed to determine the potential hazard and shall be resurveyed within 30 days of any significant modifications or changes in work routine which could impact/alter the noise intensity/exposure level.

(4) All noise measurements taken to determine an individual's exposure shall be conducted with the microphone of the measuring instrument placed at a height which most closely approximates the position/location of the worker's ear during normal working conditions. Repeated measurements may be required during a single day and/or on different days of the week to account for the variations in noise levels produced by changes in operational schedules and procedures.

(5) The record of noise measurements shall be kept by the measuring activity for a period of 50 years. If measurements are made by a ship's IHO, the records shall be turned over to a supporting shore medical activity for retention. The shore activity will establish a file for each ship. Records shall include, as a minimum the number, type, and location of the noise sources; number and identification of personnel in the work area and their daily noise exposure and duration; type, model, serial number of test equipment, and calibration data; location, date, and time of noise measurements; noise levels measured and hazard radius; and the name and signature of the person(s) who made the survey. Noise survey data may be recorded on NEHC 5100/17 and 5100/18 or DD 2214 as applicable.

b. **Exposure Assessment.** The specialized equipment to be used by an industrial hygienist or occupational audiologist may include octave band analyzers, recorders and personal noise dosimeters.

(1) The criteria outlined in paragraph 1, Navy Occupational Exposure Limits (NOEL) shall be used to determine the degree of compliance with applicable standards.

(2) A noise hazardous area is defined as:

(a) Any work area where the A-weighted sound level (continuous or intermittent) is routinely greater than 84 dB(A).

(b) Any work area where the peak sound pressure level (impulse or impact noise) routinely exceeds 140 dB.

**NOTE:**

Routinely is defined as those areas/equipment where the noise is of sufficient intensity and duration that it can reasonably be expected exposure will result in a loss of hearing sensitivity.

(3) Noise hazardous equipment is that which produces sound levels greater than 84 dB(A) or 140 dB peak sound pressure level.

(4) Per reference B4-5, 8-hour time-weighted average (TWA) noise levels shall be determined for all personnel working in noise hazardous areas at least once during assignment and within 30 days of any change in operations affecting noise levels.

(5) A risk assessment code (RAC) shall be assigned to all potentially hazardous noise areas and operations (see chapter A4). This will normally be accomplished as part of the Industrial Hygiene Surveys described in chapter A3.

(6) Since there are a wide variety of noise measuring instruments in use, any one of the following methods should be used. In each case, it is necessary to take a sufficient number of measurements to achieve a representative noise sample.

(a) When using a dosimeter that is capable of C-weighted measurements:

1. Obtain the C-weighted dose for the entire workshift, and convert to TWA sound level (see dosimeter instruction manual for conversion table).

2. Subtract the NRR from the C-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(b) When using a dosimeter that is not capable of C-weighted measurements, the following method may be used:

1. Convert the A-weighted dose to TWA (see dosimeter instruction manual).

2. Subtract 7 dB from the NRR value.

3. Subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(c) When using a sound level meter set to the A-weighting network:

1. Obtain the A-weighted TWA.

2. Subtract 7 dB from the NRR and subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(d) When using a sound level meter set on the C-weighting network:

1. Obtain a representative sample of the C-weighted sound levels in the environment.

2. Subtract the NRR from the C-weighted average sound level to obtain the estimated A-weighted TWA under the ear protector.

The effective reduction of any combination of insert plugs with circumaural muffs (double protection) is considered to be approximately 30 dB. If the result of subtracting the estimated reduction value of a particular device or combination of devices from the measured workplace sound level is determined to be below 84 dB(A) or 140 dB peak, the protection is considered to be adequate. However, should the 8-hour (protected) TWA exceed 84 dB(A), administrative controls shall be instituted to reduce personnel exposure to acceptable levels.

c. **Removal of Personnel from Hearing Conservation.** A conservative approach will be taken in making a decision to remove personnel from hearing conservation.

(1) Judgments shall be based on repeated and representative measurements that indicate that the individual is exposed to less than 70 percent noise dose or has an 8-hour time-weighted average (TWA) of less than 82 dB(A). This ensures, with an approximate 95 percent confidence level, that individuals will not be overexposed.

(2) Recommendations for removal of individuals who are already included in the hearing conservation will be made only by professionals qualified to perform or evaluate noise exposure assessments. In no case will individuals already included in hearing conservation be disenrolled based upon exposure assessment alone without concurrence from an audiologist or qualified physician. Such concurrence is necessary to avoid exclusion of personnel who are noise susceptible or at exceptional risk due to pre-existing hearing loss. See paragraph 4d for hearing tests for personnel being removed from hearing conservation.

3. **Personal Hearing Protective Devices.** In cases where personal hearing protection devices do not sufficiently reduce personnel effective exposure levels to less than 84 dB(A) administrative control of exposure time will be necessary. A table of noise exposure limits is found in appendix B4-B.

#### 4. **Hearing Testing and Medical Evaluation**

a. **Hearing Test.** Audiometers used in the performance of hearing tests shall conform to the standards defined in the most current edition of reference B4-6. Hearing tests shall be pure tone, air conduction hearing threshold examinations to include, as a minimum, test frequencies of 500, 1,000, 2,000, 3,000, 4,000 and 6,000 Hz and shall be taken separately for each ear. Tests shall be performed by an audiologist, otolaryngologist, qualified physician or by a person certified by the NAVENVIRHLTHCEN Norfolk or the equivalent organization of another U.S. military service. Hearing tests shall be conducted in an audiometric chamber with internal ambient sound levels not exceeding those prescribed in reference B4-5.

(1) Audiometric booths must be certified annually by an industrial hygienist, audiologist or other qualified personnel under their direct supervision.

(2) The use of noise excluding audiometric earphones is not permitted to augment the performance of a deficient (e.g., non-certifiable) audiometric test room. Their use for minimizing ambient noise masking effects during testing is allowed within a certified room.

**b. Reference (Baseline) Hearing Tests**

(1) All personnel included in hearing conservation shall have a reference hearing test (form DD 2215) in their medical record.

(2) All reference hearing tests shall be preceded by at least 14 hours without exposure to workplace noise. This requirement may not be met by wearing hearing protective devices. Reference (baseline) hearing tests will not be conducted if there is evidence of a transient medical condition that would affect hearing threshold.

(3) Personnel who do not have a reference audiogram filed in their health record shall not be assigned to duty in a designated hazardous noise area involving exposure to hazardous noise until a reference hearing test has been performed. In these cases, hearing threshold levels in either ear in the excess of an average of 25 dB for the frequencies of 500 - 3000Hz or 45dB at any frequency greater than 4000Hz must be evaluated by an audiologist.

**c. Monitoring Hearing Test.** All personnel included in hearing conservation will receive annual monitoring hearing tests for as long as they remain enrolled, unless otherwise indicated in the following paragraphs. Additional hearing tests may also be conducted when there are individual complaints of hearing difficulties, i.e., difficulty in understanding speech or a sensation of ringing or fullness in the ear(s). At the discretion of an audiologist or medical officer, evaluation and medical record entries will be necessary to discover and document the existence of occupational versus non-occupational etiology.

**NOTE:**

All personnel shall bring their personal hearing protective devices with them when they report for monitoring audiometry.

(1) Consult reference B4-1 for detailed Medical Department guidance for the provision of monitoring audiometry, follow-up testing, and case management of personnel with noise-induced hearing loss.

(2) The monitoring audiogram shall be compared to the most current reference audiogram to determine if a significant threshold shift (STS) has occurred.

(a) Significant threshold shift (STS) is defined as a change of 15 dB or greater at any test frequency from 1000 to 4000 Hz in either ear or a change in hearing averaging 10 dB or more at 2000, 3000 and 4000 Hz in either ear.

(b) When an STS is identified, additional monitoring hearing tests shall be performed to determine if the threshold shift is temporary or permanent in nature. The member's division officer or MDR will be informed of the time and place for follow-up testing.

(c) A significant threshold shift will be considered permanent when so determined by an audiologist or appropriately trained physician. Individuals will be informed in writing within 21 days of any permanent threshold shift toward deteriorated hearing. When the permanent threshold shift results from exposure to hazardous noise levels, the hearing loss shall be reported to the safety officer and department head by memo that a possible

breach in the Hearing Conservation control procedures has occurred, resulting in a hearing loss.

(3) Any individual who has hearing loss in both ears in which the sum of thresholds at the frequencies of 3000, 4000 and 6000 Hz exceeds a total of 270 dB or has their reference hearing test (form DD 2215) re-established three times will not be assigned to duties involving exposure to hazardous noise until evaluated and waived by an audiologist, otologist, or occupational medicine physician.

d. **Removal Hearing Tests.** Individuals who are removed from hearing conservation will be given a hearing test to document auditory status at the time of removal from noise hazardous duties. Results of this test will be recorded on DD 2216.

e. **Disposition Following Monitoring Hearing Tests.** Pure tone air conduction monitoring hearing tests are designed to detect small changes in hearing and identify problems before the individual suffers hearing loss that interferes with verbal communications. Detection is made by comparing the current monitoring audiogram with the reference audiogram to determine STS.

(1) Annual

(a) If the annual audiogram shows no significant threshold shift, the individual shall be returned to duty and recalled for hearing testing in 1 year.

(b) If the annual audiogram shows STS toward improved hearing, then the individual should be re-tested immediately to determine if the baseline/reference test was in error, hearing has actually improved, or the annual test was invalid. If the repeat audiogram continues to show STS and is plus or minus 5dB from the annual test, re-establish the reference based on the first follow-up test and repeat the test in 1 year. Nothing else is required.

(c) If the annual audiogram shows a significant threshold shift toward deteriorated hearing, then the individual must be re-tested following at least 14 hours of exclusion from noise levels in excess of 80 dB(A). Because the presence of a STS implies that hearing protective equipment used may be inadequate, physical exclusion from noise may not be accomplished by the use of hearing protective equipment. The physical exclusion period is referred to as "auditory rest." The required 14 hours of "auditory rest" is usually sufficient to allow a temporary STS to return to pre-exposure levels.

(2) Follow-up No. 1

(a) If the first follow-up audiogram shows no significant threshold shift relative to the reference audiogram (ie. STS has resolved), personnel shall have their hearing protective devices refitted, be re-indoctrinated in their use, and returned to duty to be recalled for a hearing test in 1 year.

(b) If the first follow-up supports the existence of STS, then a possible conductive or mechanical basis for the shift must be ruled out before proceeding with follow-up. The preferred method to rule out conductive hearing loss is through screening tympanometry and otoscopy, provided by the audiometric technician or MDR. Subjects who demonstrate normal otoscopy and tympanometry should have that fact noted on a SF 600, and may then immediately receive their second follow-up hearing test. If tympanometry is unavailable,



05 October 2000

then any health care provider can provide examination and clearance to continue the audiometric test sequence. Otoscopic/tympanometric anomaly requires medical evaluation prior to resuming the test sequence. Again, the second follow-up may be given on the same day as the first follow-up if middle ear function is normal.

(c) At any point in the monitoring process, a health care provider has the option of discontinuing the sequence and referring the patient to an audiologist for further evaluation, if results appear invalid or a severe condition is suspected.

(3) Follow-up No. 2

(a) If the second follow-up test shows no STS relative to the reference audiogram, personnel shall have their hearing protective devices refitted, be re-trained in their use, and be returned to duty.

(b) If the second follow-up test continues to show STS relative to the reference audiogram, the health care provider will refer the individual for diagnostic evaluation or consultation with an audiologist. However, for personnel who continue to demonstrate essentially normal hearing sensitivity despite their threshold shift, the audiologist or suitably trained physician who would otherwise receive the referral may elect to provide a written protocol for case management. The protocol may include the option of shipboard counseling and revision of the reference audiogram without additional testing or review.

f. Termination Hearing Tests. Personnel shall receive a hearing test upon termination of service.

**Appendix B4-B**

**ADMINISTRATIVE CONTROL OF NOISE EXPOSURE**  
**WITH HEARING PROTECTIVE DEVICES (STAY TIME)**

---

		Limiting time (hr:min per 24 hour day)			
Sound level		Hearing protector noise reduction (dB)			
dB (A)		10	20	30	40
90		16	--	--	--
94		8	--	--	--
98		4	--	--	--
102		2	11:18	--	--
106		1	5:39	--	--
110		0:30	2:49	16	--
114		0:15	1:25	8	--
118		--	0:42	4	--
122		--	0:21	2	11:18
126		--	--	1	5:39
130		--	--	0:30	2:49
134		--	--	0:15	1:25
138		--	--	--	0:42

---

NOTE: Values other than those given above may be calculated using the formula:

$$T = 16/2 [(L-80)/4]$$

Where: T = Time in hours (decimal)  
L = Effective sound level, (dB(A))

Intermediate values may be interpolated by adding or subtracting the decibel difference to the appropriate column.

## Appendix B4-C

### ADDITIONAL NOISE ABATEMENT INFORMATION

1. **Introduction.** The primary means of protecting Navy personnel from hazardous noise levels shall be through the application of engineering controls. Administrative controls (e.g., the adjustment of work schedules to limit exposure) are also effective but often result in some loss in productivity. Personal protective equipment (earplugs or muffs) shall be the permanent solution only when engineering or administrative controls are considered to be infeasible or cost prohibitive. General hazard (including noise) control techniques are discussed in more detail in chapter A3; therefore, this chapter will address only specific concepts.

2. **Preventive Measures.** It is much less costly to eliminate potential noise problems in the design or procurement stage for new processes, equipment, and facilities than it is to make retrofits or modifications after the fact. The following guidance is provided to meet this objective.

a. **Procurement specifications** for all new machinery and equipment to be located in spaces where personnel are required to perform work shall prescribe the lowest noise emission level that is technologically and economically feasible. The objective is to ensure, if feasible, an A-weighted sound level of 84 dB or less at all locations in which personnel are required to work.

b. **New ship design**

(1) Low noise emitting equipment and acoustical treatment shall be incorporated during the various design stages for all new construction ships so that the equivalent noise level at watchstander stations is less than 84 dB(A) under full power operating conditions where economically and technologically feasible. In any case, watchstander stations will not exceed a maximum, equivalent noise level of 90 dB(A) at the sustained speed operating conditions.

(2) Procurement specifications for all new machinery and equipment to be located in spaces where personnel are required to perform work shall prescribe the lowest noise emission level that is technologically and economically feasible. The objective is to ensure, if feasible, an A-weighted sound level of less than 84 dB at all locations in which personnel are required to work.

c. **Repeat ship design.** The policy cited above shall apply and incorporate the noise control technology learned from previous ship designs.

d. **Ship alteration.** Ship alteration prioritization policy established in reference B4-7 shall form the basis of selecting ships for noise control. All watchstander stations in machinery spaces will not exceed a maximum, equivalent noise level of 90 dB(A) under full power operation conditions where economically and technologically feasible. In any case, watchstander stations will not exceed a maximum, equivalent noise level of 90 dB(A) at sustained speed operating conditions.

e. The policy stated in paragraphs 2b, c, and d does not apply to high performance ships, experimental ships or special purpose ships for which noise reduction technology application is not feasible. In these uniquely military situations, COMNAVSEASYS COM, in conjunction with BUMED, will study and develop suitable noise requirements, engineering controls, and hearing protective de

vices to protect personnel from hazardous noise levels based on ship operating requirements and personnel rest-duty cycles.

3. **Abatement of Existing Noise Hazards**

a. Abatement of hazardous noise levels shall be undertaken, to the extent possible or practicable, by one or more of the following methods:

(1) By engineering design to eliminate or reduce the noise level of machinery, equipment, and other operating devices/facilities to acceptable levels

(2) By damping the noise by means of lamination, mufflers, mountings, couplings, supports, insulation or application of acoustic materials

(3) By acoustical enclosure of the noise producer

(4) By isolation of the noise producer to a point where the noise will affect fewer personnel

(5) By substitution of less noisy operations (e.g., welding in lieu of riveting)

(6) By administrative controls which limit exposure (e.g., control of work schedules).

**Appendix B4-D**

**HEARING PROTECTIVE DEVICES**

	Manufacturers Nomenclature/NSN	Type of Protector	Federal Nomenclature
1	Ear Defender V-51R 6515-00-442-4765	Insert Earplug (sized)	Plug, Ear, Noise Protection 24's (X-Small) (White)
2	Ear Defender V-51R 6515-00-467-0085	Insert Earplug (sized)	Plug, Ear, Noise Protection 24's (Small) (Green)
3	Ear Defender V-51R 6515-00-467-0089	Insert Earplug (sized)	Plug, Ear, Noise Protection 24's (Me- dium) (Intl. Orange)
4	Ear Defender V-51R 6515-00-442-4807	Insert Earplug (sized)	Plug, Ear, Noise Protection 24's (Large) (Blue)
5	Ear Defender V-51R 6515-00-442-4813	Insert Earplug (sized)	Plug, Ear, Noise Protection 24's (X-Large) (Red)
6	Comfit, Triple Flange 6515-00-442-4821	Insert Earplug (sized)	Plug, Ear, Noise Protection 24's (Small) (Green)
7	Comfit, Triple Flange 6515-00-442-4818	Insert Earplug (sized)	Plug, Ear, Noise Protection 24's (Me- dium) (Intl. Orange)
8	Comfit, Triple Flange 6515-00-467-0092	Insert Earplug (sized)	Plug, Ear, Noise Protection 24's (Large) (Blue)
9	Silaflex (Blister Pack) 6515-00-133-5416	Non-Hardening Silicone	Plug, Ear, Noise Protection, Cylindri- cal, Disposable 200's
10	EAR or Deci-Damp 6515-00-137-6345	Foam Plastic Insert	Plug, Ear, Noise Universal Size, Yellow 200 pr
11	Sound-Ban 6515-00-392-0726 6515-00-181-8058	Headband, Earcaps	Plug, Ear, Hearing Protection Universal Size

	Manufacturers Nomenclature/NSN	Type of Protector	Federal Nomenclature
12	Straightaway Muffs 4240-00-759-3290 4240-00-674-5379 4240-00-979-4040	High Performance Circumaural Muffs For 9 AN/2 For 9 AN/2	Aural Protector Sound 372-9 AN/2 Replacement Filler, Dome Replacement Seal, Dome
13	Ear Plug Cases 6515-01-100-1674	--	Case, Earplug
14	Circumaural Muff 4240-00-22-2946	Type II Headband/Napeband	Aural Protector, Sound

#### POSITIVE AND NEGATIVE FEATURES OF HEARING PROTECTIVE DEVICES

Type Wear	Positive	Negative	Length of Wear
Earplug (V-51R or Tri- ple Flange)	After adaptation can be used for long periods. Rela- tively inexpensive	Individual fitting by medical person- nel. May cause ini- tial sore- ness/irritation	Long term (3-4 hours)
Headband Ear Caps (Sound-Ban)	Quickly fitted without touching	Uncomfortable after 1 hour	Short term. Easily carried
Disposable Plugs (Silaflex, E.A.R., or De- cidamp)	Comfortable. Universal fit. Effective if prop- erly used	Easily soiled. Relatively expen- sive. Often poorly inserted, reducing effectiveness	Typically short term, but comfort- able for extended wear
Circumaural Muffs	Comfortable. May be worn over plugs. Most uni- versal fit for most users	Expensive. Heavy. Difficult to carry. Fit may be compro- mised by long hair or eyeglasses	Long or short-term

One single type of hearing protective device will not meet the needs of all noise-exposed personnel. The appropriate type of hearing protective device should be selected based upon a consideration of the factors listed above in addition to the degree of attenuation required in a particular situation. The most convenient method of making this determination is the Noise Reduction Rating (NRR) developed by the Environmental Protection Agency (EPA). The NRR is usually shown on the hearing protector package. The NRR is then related to an individual worker's noise environment in order to assess the adequacy of the attenuation of a given hearing protector.

05 October 2000

**CHAPTER B5****SIGHT CONSERVATION****B0501. DISCUSSION**

a. Navy policy requires personnel working in eye-hazard areas or operations be provided adequate eye protection at government expense. Examples of potentially eye hazardous operations are: cutting and welding, drilling, grinding, milling, chipping, sand blasting, or other dust and particle producing operations and pouring or handling molten metals or corrosive liquids and solids. Personnel in the immediate vicinity of such operations or entering a posted eye hazard area shall wear eye protective equipment.

b. Devices for eye protection, such as safety glasses, chipper's goggles, welder's goggles, chemical goggles, and face shields, shall be selected using the guidance provided in appendix B5-A. This appendix complies with references B5-1, B5-2, and B5-3. As a minimum, the protective devices provided shall be approved by the American National Standards Institute (ANSI), labeled "Z-87", and adequate for the hazards specified.

c. Refer to specific chapters for eye protection guidance.

**B0502. PROGRAM RESPONSIBILITIES**

a. **The safety officer shall:**

(1) Evaluate areas, processes, and equipment for sight hazards if not previously evaluated or modifications have been made. Determine appropriate sight protective equipment per the baseline industrial hygiene survey, or appendix B5-A. Assistance may be requested from an industrial hygienist if difficulty in making such a determination is experienced.

(2) Maintain a current listing of all areas and processes that require eye protection and those areas that require eye wash or deluge shower facilities. A list of eye hazardous areas and processes is provided in the baseline industrial hygiene survey, and shall be updated as needed.

b. **Division officers shall:**

(1) Ensure that areas identified as eye hazardous are properly marked and labeled.

(2) Ensure personnel use proper eye protective devices when required.

(3) Ensure that personnel who work in eye hazard areas or operations are trained on the need for and proper use of protective eyewear and on the location and use of eyewash facilities.

(4) Refer personnel who wear corrective eyewear and work in eye hazard areas to obtain prescriptive safety eyewear from the medical department.

c. **The MDR shall** provide personnel who require corrective lenses and work in eye hazard areas, with prescription eyewear with side shields that meet the requirements of ANSI Z-87.1.

d. **All hands shall:**

(1) Comply with posted eye hazard warning labels.

(2) Properly wear required eye protective equipment.

**B0503. SIGHT CONSERVATION ELEMENTS**

- a. List of Eye Hazard Areas/Processes
- b. Medical Screening
- c. Issue and maintenance of sight protection equipment (paragraph B0506)
- d. Procedures for the use and issue of temporary eyewear (paragraph B0507)
- e. Establishment of emergency eyewash facilities (paragraph B0508)
- f. Training (Paragraph B0509)

**B0504. DETERMINATION AND DESIGNATION OF EYE-HAZARDOUS AREAS/PROCESSES**

a. **Determination.** The baseline industrial hygiene survey will make an initial determination of eye-hazardous areas/processes and list them in the survey report. The safety officer will maintain and ensure that this list(s) remains current. The safety officer shall evaluate subsequent equipment/work processes introduced into the workplace to determine if they present an eye hazardous condition. The safety officer will request the assistance of an industrial hygienist, to assist in this determination, as needed.

b. **Designation.** The ship (or construction/repair yard) shall mark permanently installed equipment and processes that are eye-hazard areas with 3-inch deck striping and a CAUTION sign. The deck around an immediate eye hazard shall be marked with a 3-inch black and yellow striped or checkerboard tape. This tape is available under NSN 9Q/9905-01-342-5934 (checkerboard) or 9Q/9905-01-342-5933 (striped). Mount the sign directly above the hazard, component, machinery, boundary bulkhead, or door in a conspicuous location. The CAUTION sign shall conform to NSN 9Q/9905-01-100-8203, "CAUTION, Eye Protection Required In This Area". Eye hazard signs or labels are also available through open purchase.

**B0505. MEDICAL SURVEILLANCE**

Medical surveillance is required only for personnel covered by chapter B9.

**B0506. ISSUE AND MAINTENANCE OF SIGHT PROTECTION EQUIPMENT**

a. **Issue.** The ship shall provide and issue appropriate eye protection at government expense. The list of eye hazards the safety officer maintains identifies required eye protective equipment. All eye and face protection including safety glasses (frames), chemical splash goggles, welding and chipping goggles, welding helmets, and face shields shall be labeled "Z-87", indicating compliance with American National Standards Institute (ANSI) Standard Z-87. Such eye and face protection equipment is available through the supply system. Appendix B5-A contains information that describes the types of protective eyewear frequently used on board ships.

**NOTE:**

Flight deck goggles are not ANSI-approved and, therefore, not authorized for use other than for flight operations.

b. **Prescription Protective Eyewear.** Prescription protective eyewear shall be obtained through the medical department. Open purchase procedures may be used to obtain refractive services and prescription safety lenses. The Eyewear Prescription Form, DD 771, will be used in all services and equipment procurement. The prescription and procurement forms shall be entered into the crew member's medical record.



c. **Maintenance of Protective Eyewear.** Personnel shall maintain personal protective eyewear in a clean and fully operational condition. Before re-issue, non-corrective eye protection shall be sanitized with hot, soapy water and rinsed of all traces of soap or detergent. Eye protection equipment should then be immersed for 10 minutes in a disinfectant, rinsed, and air-dried. Personnel shall immediately report damage to protective eyewear to their work center supervisor.

**B0507. TEMPORARY PROTECTIVE EYEWEAR**

Where protective corrective eyewear is necessary, the command shall provide planos or goggles to visitors and others who must enter or pass through eye hazardous areas. In addition, the command shall provide them to personnel awaiting corrective/protective eyewear.

**B0508. EMERGENCY EYEWASH FACILITIES**

a. The ship shall have an adequate number of properly maintained and inspected eyewash facilities, installed in appropriate locations, and properly posted with signs identifying their locations. Approved emergency eyewash equipment shall be capable of flushing the eyes with potable water at a minimum flow rate of 0.4 gallons per minute for 15 continuous minutes. The velocity of the water shall be low enough not to be injurious to the user's eyes. All emergency eyewash and shower equipment must be maintained through the Planned Maintenance System (PMS). Potable water valves to eyewash stations and deluge showers shall be locked open and marked as a "W" fitting.

b. For propulsion plant spaces of nuclear powered submarines, eyewash bottles may be used in lieu of permanent or portable eyewash stations and shall be readily available in nucleonics/water chemistry rooms and secondary analysis stations. Approved eyewash bottles are available through the standard stock system under NSN 6515-01-393-0728 or 6540-01-353-9946.

c. Clearly mark eyewash stations with a green sign with white lettering stating "EMERGENCY EYEWASH STATION". These signs are available through the standard stock system under NSN 9905-01-345-4521. Post signs in a visible location close to the eyewash unit.

d. The MDR shall examine crew members following the emergency use of an eyewash or shower equipment.

e. **Combination Shower/Eyewash Units.** As specified in reference B5-1, a combination of emergency shower with eyewash or eye/face wash unit with drain and stay-open valve shall be available in all areas where the eyes of crew members may be exposed to corrosive materials. These locations include:

- (1) Oxygen-nitrogen producer room
- (2) Battery shop
- (3) Battery locker
- (4) Boiler repair shop
- (5) Rubber and plastic shop
- (6) Composite material repair shop
- (7) Non-destructive test and inspection shop
- (8) Other ship non-weapon spaces the safety officer determines.

05 October 2000

f. **Eye/Face Wash Units.** On surface ships an eye/face wash unit shall be installed in:

- (1) Main and auxiliary machinery spaces
- (2) Medical
- (3) Chemical laboratories
- (4) Darkrooms if liquid chemicals are used
- (5) Hazardous material issue/storerooms
- (6) Paint Mixing and Issue Rooms
- (7) Other areas the safety officer determines.

All units shall be available in easily accessible, unobstructed locations situated as close as possible to the hazard. In no instance shall the unit be located in an area that requires more than 10 seconds to reach and is no more than 100 travel feet from the hazard. Adjacent spaces may share a single emergency shower or eye/face wash unit, provided it meets the time and distance criteria discussed above.

g. **Portable Eyewash Stations.** For those spaces that require an emergency shower, eyewash, or eye/face wash, but where potable water and drainage is not provided, the ship shall properly install a self-contained eyewash. They may order the gravity-fed eyewash stations under NSNs 4240-01-258-1245 and 4240-01-234-1796.

h. The MDR shall examine crew members in sick bay following the emergency use of an eyewash unit or deluge shower.

i. **Remotely Located Eyewash Facilities.** Permanently plumbed emergency showers, eyewashes, and eye/face washes located in remote or minimally manned areas shall be provided with a visual and audible alarm interlocking with the activation device of the unit. The alarm shall be located in one of the following appropriate areas: outside of the protected area or shop, in the associated Enclosed Operating Station (EOS), in a nearby manned space, or in Damage Control Central.

**NOTE:**

For remotely located eyewash facilities without a visible and audible alarm, the two-man rule shall be observed when eye-hazard operations are being performed until the alarm system is installed. A label plate shall be placed at eye level in the immediate vicinity of the visual alarm and shall be inscribed:

**WARNING**

**WHEN THE EMERGENCY SHOWER (EYEWASH, EYE/FACE WASH) IN (SHOP OR SPACE LOCATION) HAS BEEN ACTIVATED, PROVIDE IMMEDIATE PERSONNEL ASSISTANCE AND NOTIFY SICK BAY.**

**B0509. TRAINING**

The division officer or workcenter supervisor shall perform training for personnel assigned to workcenters with eye hazard areas/processes at the time that protective eyewear is issued. Training materials are available through the NAVOSHENVTRACEN at [www.norva.navy.mil/navosh](http://www.norva.navy.mil/navosh). Topics they shall cover in the training program include:

- a. Types of eye hazards

- b. Types of eye protection
- c. Eyewash location and proper use (particularly personnel working with corrosive materials)

**NOTE:**

No attempt should be made to remove a particle lodged in the eyeball, or wash an eye that has been cut in any way. Contact the medical department immediately.

---

**CHAPTER B5**

**REFERENCES**

- B5-1 General Specification 644c (NOTAL)
- B5-2 Military Specification DOD-G-51510: "Goggles, Industrial, Eyecup and Lenses; Goggles, Industrial (Metric)" (NOTAL)
- B5-3 Military Standard 1434: "Goggles, Industrial, Safety" (NOTAL)

05 October 2000

**Appendix B5-A****TYPES OF PROTECTIVE EYEWEAR**

Appropriate eye and face protection is required in all areas that are designated as eye hazardous. A selection chart for eye and face protection for different work operations, and a welding filter shade protection chart, are shown in tables B5-A-1 and -2. The following is a short description of the various types of protective eyewear:

a. **Safety Glasses/Spectacles**. Safety glasses are to be worn in those areas where there is a possibility of flying objects, particulates, mists, or vapors entering the eye. Those spectacles with suitable filter lenses are permitted for use with gas welding operations on light work and for inspections. Spectacle-type goggles are made both with and without metal side-shields and may have either a rigid nonadjustable or adjustable metallic bridge.

b. **Chemical Goggles**. Chemical goggles provide the eyes and eye area with protection from liquids, splashes, mists, and spray. Goggles may consist of a flexible frame or a rigid frame with a separate, cushioned fitting surface, and are held in place with a supporting band. Chemical goggles with ventilation must be splash resistant.

c. **Welding Goggles**. Welding goggles provide protection against glare and injurious radiation, as well as from flying objects, chips, and metal splashes. Eyecup-type goggles are designed to be worn alone, while cover-type goggles are designed to fit over corrective spectacles. The lens filter of welding goggles is shaded to protect the eyes from ultraviolet, infrared, and visible rays generated by the work operations.

d. **Chipping Goggles**. Chipping goggles protect the eyes from relatively large flying objects generated by such operations as chipping, lathing, grinding, and chiseling. Eyecup-type goggles may be worn alone, or cover-type goggles may be fitted over corrective spectacles.

e. **Welding Helmets**. Welding helmets are made up of a bowl-shaped or modified bowl-shaped device equipped with a Shade 14 or greater filter. These helmets are designed for use during various kinds of arc welding and heavy gas cutting and provide the welder's eyes, face, ears, and neck with protection against intense radiation and weld spatter.

f. **Face Shields**. Face shields provide protection to the face and neck from flying particles, liquids, or sprays. Face shields alone do not provide adequate protection against these hazards and must be worn with protective eyewear.

**TABLE B5-A-1. EYE AND FACE PROTECTION SELECTION CHART**

APPLICATIONS		
OPERATION	HAZARDS	PROTECTORS
ACETYLENE-BURNING ACETYLENE-CUTTING ACETYLENE-WELDING	SPARKS, HARMFUL RAYS, MOLTEN METAL, FLYING PARTICLES	7, 8, 9
CHEMICAL HANDLING	SPLASH, ACID BURNS, FUMES	2 (For severe exposure add 10)
CHIPPING	FLYING PARTICLES	1, 3, 4, 5, 6, 7A, 8A
ELECTRIC (ARC) WELDING	SPARKS, INTENSE RAYS, MOLTEN METAL	11 (In combination with 4, 5, 6, in tinted lenses, advisable)
FURNACE OPERATIONS	GLARE, HEAT, MOLTEN METAL	7, 8, 9, (For severe exposure add 10)
GRINDING-LIGHT	FLYING PARTICLES	1, 3, 5, 6 (For severe exposure add 10)
LABORATORY	CHEMICAL SPLASH, GLASS BREAKAGE	2 (10 when in combina- tion with 5, 6)
MACHINING	FLYING PARTICLES	1, 3, 5, 6 (For severe exposure add 10)
MOLTEN METALS	HEAT, GLARE, SPARKS	7, 8, (10 in combina- tion with 5, 6, in tinted lenses)
SPOT WELDING	FLYING PARTICLES, SPARKS	1, 3, 4, 5, 6 (Tinted lenses advisable, for severe exposure add 10)

Eye and Face Protectors Key:

- 1 - Goggles, flexible fitting, regular ventilation
- 2 - Goggles, flexible fitting, hooded ventilation; or goggles, chemical
- 3 - Goggles, cushioned fitting, rigid body
- 4 - Spectacles, without sideshields
- 5 - Spectacles, with eyecup type sideshields

- 6 - Spectacles, semi/flat fold sideshields
- 7 - Welding goggles, eyecup type, tinted lenses
- 7A - Chipping goggles, eyecup type, clear safety lenses
- 8 - Welding goggles, coverspec type, tinted lenses, , various shade numbers
- 8A - Chipping goggles, coverspec type, clear safety lenses
- 9 - Welding goggles, coverspec type, tinted plate lens
- 10 - Face shield, plastic or mesh window
- 11 - Welding helmet, various lenses

**TABLE B5-A-2. WELDING FILTER SHADE PROTECTION CHART**

WELDING OPERATION	SUGGESTED SHADE NUMBER*
Shielded Metal-Arc Welding, up to 5/32 in (4 mm) electrodes.....	10
Shielded Metal-Arc Welding, 3/16 to 1/4 in (4.8 to 6.4 mm) electrodes.....	12
Shielded Metal-Arc Welding, over 1/4 in (6.4 mm) electrodes.....	14
Gas Metal-Arc Welding (Nonferrous).....	11
Gas Metal-Arc Welding (Ferrous).....	12
Gas Tungsten-Arc Welding.....	12
Atomic Hydrogen Welding .....	12
Carbon Arc Welding.....	14
Torch Soldering .....	2
Torch Brazing .....	3 or 4
Light Cutting, up to 1 in (25 mm).....	3 or 4
Medium Cutting, 1 to 6 in (25 to 150 mm).....	4 or 5
Heavy Cutting, over 6 in (150 mm).....	5 or 6
Gas Welding (Light) up to 1/8 in (3.2 mm).....	4 or 5
Gas Welding (Medium) 1/8 to 1/2 in (3.2 to 12.7 mm).....	5 or 6
Gas Welding (Heavy) over 1/2 in (12.7 mm).....	6 or 8
Fire Watch For Any Welding or Cutting Operation.....	6
	(minimum)

\*The choice of a filter shade may be made on the basis of visual acuity and may therefore vary widely from one individual to another, particularly under different current densities, materials, and welding processes. However, the degree of protection from radiant energy afforded by the filter plate or lens when chosen to allow visual acuity will still remain in excess of the needs of eye filter protection. Filter plate shades as low as shade 8 have proven suitably radiation-absorbent for protection from the arc-welding processes.

**NOTE**

In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the operation (spectrum).

**CHAPTER B6**

**RESPIRATORY PROTECTION**

**B0601. DISCUSSION**

a. Many repair and maintenance operations generate air contaminants that are dangerous if inhaled. Engineering controls (e.g., local exhaust ventilation) are the most effective methods of protecting personnel against such contaminants. However, when engineering controls are not practical or feasible, respirators are necessary to assure the protection of personnel.

b. This chapter establishes respiratory protection requirements and applies to all personnel and visitors who enter an area where respiratory protective equipment is necessary. Many of the procedures contained herein are derived from or are similar to the ones detailed in reference B6-1. This chapter does not address damage control, gas free engineering, or underwater protection.

c. The provisions of this chapter do not apply to personnel wearing respiratory protection for the sole purpose of protection against airborne radioactive contamination. The provisions for protection against airborne radioactive contamination are found in reference B6-2.

c. **For submarines.** Responsibilities and procedures for respiratory protection aboard submarines are contained in paragraph B0615.

**B0602. RESPONSIBILITIES**

a. **The commanding officer shall** appoint a respiratory protection manager (RPM).

b. **The respiratory protection manager shall:**

(1) Qualify per B0612 within 3 months of assuming the position.

(2) Ensure a sufficient supply of NIOSH or NIOSH/MSHA-approved respirators, spare parts, and expendable supplies (e.g. cartridges and filters) is maintained to conduct routine and emergency operations. There should be at least three sizes of elastomeric face pieces and associated supplies of at least two manufacturers.

**NOTE:**

Respirator parts and filters are not interchangeable. Ensure that all components are of the same manufacturer (e.g. Brand X facepieces must have Brand X filters).

(3) Base the selection of the class of respirators on the type and degree of hazards to which workers are exposed.

(4) Maintain a roster of personnel enrolled in Respiratory Protection.

(5) Conduct respirator fit testing per paragraph B0608.

(6) Establish central control points for issuing and maintaining respiratory protection equipment. Divisions that frequently use respirators and personnel who are assigned individual respirators may maintain custody of



their own respiratory protection equipment and are responsible for its proper case and storage.

(7) Inspect, clean, disinfect, store, maintain and repair respirators per paragraph B0609.

(8) Ensure breathing air meets the requirements of paragraph B0611.

c. **Division officers shall:**

(1) Ensure that personnel performing work requiring respirators are assigned and qualified prior to use of respiratory protective equipment. Use the form in appendix B6-A to request medical qualification.

(2) Ensure that personnel have a current fit test and training prior to donning a respirator.

(3) Provide personnel with the required respiratory protective equipment.

d. **The medical department representative (MDR) shall:**

(1) Conduct or schedule necessary preplacement and periodic medical evaluation of personnel identified by the RPM as respirator users per paragraph B0614.

(2) Certify to the cognizant division officer and the RPM whether an individual is medically qualified to use a particular respirator. Use the form in appendix B6-A for this purpose.

(3) Enter results of all respirator user medical evaluations into the individual's medical records.

(4) Assist the RPM in identifying and evaluating hazards and selecting appropriate respirators.

e. **Personnel issuing respiratory protective equipment shall** issue respirators only to personnel who are trained, medically qualified and successfully fit-tested for the respirator(s) requested.

f. **All hands shall:**

(1) Inspect the respirator before and after each use per paragraph B0609a.

(2) Perform a positive and negative respirator facepiece seal check prior to each use per paragraph B0607b.

(3) Report any malfunction of the respirator to their immediate supervisor.

(4) Prevent damage to or loss of respiratory protective equipment.

**B0603. RESPIRATORY PROTECTION ELEMENTS**

a. Respiratory protection management

b. The industrial hygiene survey

- c. Respirator selection
- d. Respirator availability
- e. Personnel roster
- f. Medical evaluations
- g. Initial and annual fit testing and training
- h. Respirator issue
- i. Respirator maintenance
- j. Breathing air requirements

**B0604. TYPES OF RESPIRATORS AND THEIR APPLICATIONS**

The two basic types of respirators are air-purifying and atmosphere-supplying. Illustrations of typical respirators are provided in appendix B6-B.

a. Air-purifying respirators remove air contaminants by filtering, or absorbing them as the air passes through the cartridge. In all cases when using air-purifying respirators, adequate oxygen (19.5 percent by volume) must be present. They are available with quarter-, half-, and full-facepieces with the full-facepiece respirator providing a higher degree of protection than either of the others. Air-purifying respirators are available as single-use (e.g., disposable) respirators, with the filter or cartridge built-in as an integral part of the respirator, or as reusable facepieces with replaceable cartridges, filters, and pre-filters of many types. They are effective only when used with the appropriate cartridges, filters, and pre-filters for the air contaminants present. Air-purifying respirators may be either non-powered or powered. The non-powered type depends on the user's lungs to draw air through the purifying element during inhalation; therefore, the non-powered type has the greatest breathing resistance. The powered type is equipped with a battery-powered fan that forces air through the purifying element, thus reducing the breathing resistance and ensuring a positive pressure inside the facepiece. Whether powered or non-powered, air-purifying respirators may be subdivided by the type of contaminant they protect against as described below.

(1) Particulate air-purifying respirators use cartridges, filters, and pre-filters designed to protect against inhalation of aerosols, i.e., solid or liquid particles dispersed in air. The cartridges, filters, and pre-filters remove nuisance (e.g. non-toxic) and toxic dusts, fogs, fumes, mists, smokes and sprays either singly or in combination. Their construction varies according to the intended use that is specified in each device's approval. SURGICAL MASKS (blue or green) do not provide protection against air contaminants. They are for **MEDICAL/DENTAL USE ONLY** and must **NEVER** be used as an air-purifying respirator.

(2) Gas and vapor air-purifying respirators use cartridges and canisters that remove contaminants through absorption and adsorption. Typically, a cartridge removes a specific type of gas or vapor, i.e., organic vapors or acid gases.

(3) Combination cartridges and canisters are available which combine the removal capabilities of two or more type cartridges in a single cartridge, i.e., organic vapor and particulate removal, acid gas and organic vapor removal, or acid gas, ammonia, and organic vapor removal. Some manufacturers allow users to create their own combination cartridges by screwing two car-

tridges together; however, always follow the manufacturer's recommendations when doing this since there may be some limitations.

(4) **Prefilters.** All manufacturers allow the user to combine different degrees of particulate removal with any cartridge by attaching a pre-filter to the cartridge by means of a retainer ring. Such systems are commonly used to protect against an aerosol containing a volatile organic solvent.

(5) **Color Coding.** By Federal regulation, each type of respirator cartridge/canister is color coded to identify its intended use. The color-coding may be achieved by coloring all or part of the cartridge/canister case or by affixing a colored label.

(6) **Labeling.** Each cartridge/canister is labeled with the contaminant(s) it protects against and the NIOSH/MSHA approval number. Some labels may provide more information about the cartridge's capabilities and limitations.

(7) Military gas masks (e.g., Mark V, M17) are military-unique air-purifying respirators that are only to be used for chemical-biological-radiological (CBR) warfare. MILITARY GAS MASKS MUST NEVER BE USED IN PLACE OF AN AIR-PURIFYING RESPIRATOR. This chapter does not apply to the use and maintenance of military gas masks.

b. Atmosphere-supplying respirators are used when the contaminant has no warning property (e.g., no odor), the contaminant's concentration is too high to use an air-purifying respirator, or the environment is immediately dangerous to life or health (IDLH). The two types are supplied-air respirators and self-contained breathing apparatuses.

(1) Supplied-air respirators are further subdivided into hose mask and air-line respirators.

(a) Hose mask respirators consist of a facepiece, breathing tube, harness, and large-diameter, thick-wall, non-kinking, air-supply hose. A blower, either motor or hand driven, may supply the air, or the user, unaided, may simply draw the air into the hose with each breath. This respirator offers no advantages over the air-line respirator and is being removed from the fleet.

(b) Air-line respirators consist of a facepiece, hood, helmet, or suit; breathing tube; regulator; and small-diameter hose provided with some means to attach the hose to the user. A compressor, ambient air breathing apparatus (AABA), or compressed air cylinder(s) provides the air. The maximum length of hose allowed from a compressor or air fitting to the respirator shall be 300 feet unless a shorter maximum length is specified on the NIOSH/MSHA approval. The NIOSH/MSHA approval for each air-line respirator applies to the combination of the respirator and air supply hose as a unit and specifically to the part numbers listed on the approval. Any use of another manufacturer's respirator or hose automatically invalidates the approval. Air-line respirators can be subdivided into three types as follows:

1. **Demand.** Available only with a facepiece, it supplies air to the user on demand (inhalation) which creates a negative pressure within the facepiece. Leakage into the facepiece may occur if there is a poor seal between the respirator and the user's face.

2. **Pressure Demand.** Available only with a facepiece, it maintains a continuous positive pressure within the facepiece, thus preventing contaminant leakage into the facepiece.

3. Continuous Flow. Available with a facepiece, hood, helmet, or suit, it provides a continuous positive pressure and flow of air within any of the breathing zone containments, thus preventing contaminant leakage into the containment.

(2) Self-contained breathing apparatuses (SCBAs) consist of a facepiece, helmet, or hood; a breathing tube; and a source of air or oxygen, all of which is carried by the wearer. They may be subdivided into two categories.

(a) Closed-circuit (Rebreathing) SCBAs. There are two types of this respirator. In both types carbon dioxide (CO<sub>2</sub>) in the exhaled breath is removed by a chemical canister prior to rebreathing. The difference between the two is the source of oxygen. In one type, the oxygen is provided by either high-pressure gaseous oxygen or gaseous oxygen converted from liquid oxygen. In the other type, of which the Navy "oxygen breathing apparatus" (OBA) is an example, the water vapor in the exhaled breath reacts with a chemical in the canister to release oxygen. The OBA is not approved by NIOSH/MSHA for commercial use, and its only authorized uses aboard ship are for damage control, fire-fighting operations, and fixed flooding systems PMS. Even in emergencies, OBAs must not be used in flammable atmospheres due to the heat generated by the canister.

(b) Open-circuit SCBAs. In this type of SCBA, the exhaled air is expelled to the atmosphere and air is provided to the user from a compressed air cylinder. This type of respirator is available in either a demand (negative facepiece pressure) or pressure-demand (positive facepiece pressure) model.

(c) Emergency Escape Breathing Device (EEBD). This is a special type of SCBA developed for the Navy specifically for emergency escape from shipboard fires. They have a very short duration air supply. **THEY MUST NEVER BE USED FOR ENTRY INTO A HAZARDOUS ATMOSPHERE; THEY ARE FOR ESCAPE ONLY!** This chapter does not apply to the use and maintenance of the EEBD.

(d) Supplemental Emergency Escape Device (SEED). This is another special type of SCBA developed for main propulsion space watch standers ONLY. They have a very short duration air supply. **THEY MUST NEVER BE USED FOR ENTRY INTO A HAZARDOUS ATMOSPHERE; THEY ARE FOR ESCAPE ONLY!**

#### **B0605. RESPIRATOR SELECTION**

a. Approval. Only respirators which are approved by NIOSH shall be used. If there is any doubt as to the respirator required to protect against a particular contaminant, an industrial hygienist should be consulted.

b. Hazard Assessment. Determining the type of contaminant and its concentration is the most important consideration in the selection of respirators. This determination shall be provided as part of the most current industrial hygiene survey or by an industrial hygienist upon request. The industrial hygiene survey report of the industrial hygienist shall identify and evaluate the respiratory hazard(s) in the workplace; this evaluation shall include a reasonable estimate of employee exposures to respiratory hazard(s). Where the employee's exposure to respiratory hazard(s) cannot be identified or reasonably estimated by the industrial hygienist, the atmosphere shall be considered "Immediately Dangerous to Life or Health" (IDLH). The following are some chemical, physical and toxicological properties that should be considered in the selection of a respirator:

(1) Warning properties of the contaminant gas or vapor (smell, eye irritation or respiratory irritation). Some contaminants lack sufficient warning properties to alert the wearer of respirator failure. Vapor- and gas-removing respirators are not approved for these contaminants, which include carbon monoxide, hydrogen cyanide, isocyanates and methyl alcohol.

(2) Whether the contaminant is absorbed through the skin.

(3) Whether any of the contaminants are "Immediately Dangerous to Life or Health" (IDLH) or whether injurious effects would be produced after prolonged exposure.

(4) Concentration of the contaminant in the atmosphere.

(5) NAVOSH standard for the contaminant(s). See chapters B1 and B10 for standards for lead and asbestos.

(6) Whether an oxygen-deficient or oxygen-rich atmosphere exists or may be created.

(7) The nature, extent and frequency of the duties to be performed by personnel (e.g., welding or painting) in the work area.

(8) Degree of protection provided by the particular respirator.

#### **B0606. LIMITATIONS OF RESPIRATORS**

Sections B0604 and B0605 mention some general limitations; however, the following provides more specific information.

a. **Protection Factor.** Each type of respirator provides protection against a contaminant up to a concentration that is a multiple (e.g., 10 times, 50 times, etc.) of that contaminant's permissible exposure limit or action level (see chapters B1 and B10 for some examples). Protection factors are described in detail in reference B6-3, but certain Federal standards may assign a lower protection factor for use against a specific contaminant. Since a full-facepiece is less likely to have its facepiece seal broken due to movement, talking, etc., a full-facepiece respirator usually has a higher protection factor than a quarter- or half-facepiece respirator.

b. **Oxygen-deficient Atmospheres.** All air-purifying respirators require that sufficient oxygen be present in the atmosphere where they will be used. Sufficient oxygen is defined as at least 19.5 percent oxygen for use at essentially sea level.

c. **Hose Length/Configuration and Air Pressure Requirements for Air-line Respirators.** The approval specifies the maximum length of air supply hose that may be used with each respirator and this is a function of the pressure of the supplied air.

#### **NOTE:**

The allowed hose length for supplied-air respirators is specified on the NIOSH approval certificate, but in no case shall the length exceed 300 feet maximum. Supplied-air respirators shall be operated at the conditions of pressure and hose length specified in the NIOSH approval. Only those hoses supplied by the respirator manufacturer shall be used. Air-line couplings shall be incompatible with outlet

couplings for other gas systems to prevent inadvertent servicing with non-respirable gases or oxygen.

d. **Environmental Temperature Operating Ranges.** Atmosphere-supplying respirators have specific temperature ranges for which they are approved. Consult the manufacturer's specifications before use in extreme temperatures.

e. **Maximum Use Concentrations.** Regardless of the protection factor, some air-purifying cartridges and canisters are limited to use at or below a specific contaminant concentration. This is generally due to the capacity (e.g., size or removal efficiency) of the cartridge or canister to remove certain contaminants. The approval certificate should always be consulted before use to determine what additional use restrictions apply.

#### **B0607. USE OF RESPIRATORS**

a. Prior to using a respirator to perform work that requires respiratory protection, the following requirements shall be met:

(1) The user shall be certified by the MDR as medically qualified to use each type of respirator required per Section B0614, unless the user is to wear a SCBA. SCBAs are exempt from the requirement for medical qualification.

(2) The user shall pass a fit-test with each type of respirator to be used per Section B0608, unless the user is to wear a SCBA. SCBAs are exempt from the requirement to fit test.

(3) The user shall be trained per Section B0612.

(4) Gas permeable and soft contact lenses are permitted to be worn with all respiratory protection.

(5) Tight fitting respirators shall not be worn when conditions such as facial hair, facial scars, or prescription eyeglasses prevent a good respirator seal.

b. **User Seal Checks.** Prior to each use, perform a positive and negative user seal check prior to each use.

(1) **Positive Pressure User Seal Check.** Place your palm or thumb over the exhalation valve and press lightly. Exhale gently. The respirator is properly sealed if no air leaks around the edges and a slight positive pressure is felt inside the facepiece.

(2) **Negative Pressure User Seal Check.** Place your palm(s) over the cartridge(s) or canister inlet. Inhale gently. The respirator is properly sealed if no air leaks around the edges and a slight negative pressure is felt inside the facepiece as it collapses slightly towards the face.

#### **c. Warning Signs of Respirator Failure**

(1) **Particulate Air-purifying Respirator.** When breathing difficulty is encountered with a particulate air-purifying respirator (increased resistance due to partial clogging), the filter(s) must be replaced. If the respirator is a single-use (e.g., disposable) respirator then the respirator must be discarded.

(2) **Vapor or Gas Air-purifying Respirator.** When using a vapor or gas air-purifying respirator, if the user notices any of the warning properties,

(e.g., odor, taste, eye irritation (with a full facepiece respirator)), or respiratory irritation, he/she should promptly leave the area and replace the cartridge or canister before returning.

(3) **Service Life of Air-purifying Respirator Filters, Canisters, and Cartridges.** Filters, canisters, and cartridges for air-purifying respirators are intended to be used until filter resistance precludes further use, or the chemical sorbent is expended as signaled by the detection of a specific warning property (e.g., odor, taste, and/or irritation).

(a) Change end-of-service-life indicator cartridges and canisters when indicated by the appropriate color change. End-of-service-life indicator cartridges and canisters must be worn belt mounted or chest mounted, respectively, so that the end-of-service-life indicator can be seen.

(b) Air purifying cartridges shall be replaced whenever the user can detect contaminant warning properties, such as, odor, taste, or irritation. Cartridges shall also be replaced if the user has difficulty inhaling air through the cartridge which indicates filter overloading. The Respiratory Protection Manager may impose time limitations for cartridge use not to exceed 8 hours. When in doubt about the previous use of the respirator, replace the filter, canister, or cartridge.

(4) **Air-line Respirator.** Leave the area immediately when the compressor failure alarm is activated or if an air pressure drop is sensed.

(5) **Self-contained Breathing Apparatus.** Leave the area as soon as the air pressure alarm activates.

#### **B0608. RESPIRATOR FIT TESTING**

Each individual who is required to use a respirator shall be qualitatively or quantitatively fit tested before being issued a respirator and annually thereafter unless the user is to wear a SCBA. SCBAs are exempt from the requirement to fit test. When conditions, such as facial hair, can reasonably be expected to interfere with the proper fit of respiratory protective equipment, the user shall not be permitted to do work requiring a respirator until satisfactory fit testing can be accomplished. For all ships, anyone trained to fit test via training detailed in B0612 can perform fit testing. Fit testing can also be obtained via the supporting tender, local NEPMUs, the cognizant MTF, or other sources.

a. **Qualitative Fit Testing.** Qualitative fit testing may be performed using irritant smoke, isoamyl acetate (banana oil), saccharin mist, or the Bitrex method. Fit testing shall conform to the procedures in appendix B6-C

b. **Quantitative Fit Testing.** Personnel using respirators to protect against asbestos and lead exposure may require quantitative fit testing, per Federal regulations. This type of fit testing can only be performed by, and shall be requested from, shore activities.

#### **B0609. INSPECTION, CLEANING, STORAGE AND MAINTENANCE OF RESPIRATORS**

To ensure adequate performance and proper sanitation, respirators shall be maintained as follows:

a. **Inspections.** All respirators shall be inspected routinely before and after each use. Emergency use respirators shall be inspected after each use and at least monthly. SCBAs shall be inspected periodically to ensure proper

05 October 2000

function during an emergency response and after each use and at least monthly. Inspect the following items for at least the listed defects:

(1) **Head Straps or Head Harness**. Breaks, loss of elasticity, broken or malfunctioning buckles and attachments (full-facepiece only), excessively worn serrations on the head harness which might permit slippage.

(2) **Facepiece**. Excessive dirt; cracks, tears, holes, or distortion from improper storage; inflexibility (stretch and massage to restore flexibility); cracked or badly scratched lenses in full-facepieces; incorrectly mounted full-facepiece lens or broken or missing mounting clips; cracked or broken air-purifying element holder(s), badly worn threads, or missing gasket(s) (if required).

(3) **Inhalation and Exhalation Valves**. Foreign material, such as detergent residue, dust particles, or human hair under the valve seat; cracks, tears, or distortion in the valve material; improper insertion of the valve body in the facepiece; cracks, breaks, or chips in the valve body, particularly in the sealing surface; missing or defective exhalation valve cover; improper installation of the valve in the valve body.

(4) **Cartridge, Canister, or Filter**. Incorrect cartridge, canister, or filter for the hazard; incorrect installation, loose connections, missing or worn gaskets, or cross-threading in holder; expired shelf-life date on cartridge or canister; evidence of prior use of sorbent cartridge or canister, indicated by absence of sealing material, tape, foil, etc., over inlet.

(5) **Corrugated Breathing Tubes**. Broken or missing end connectors; missing or loose hose clamps; deterioration, determined by stretching the tube and looking for cracks.

(6) **Harness of a Front- or Back-mounted Gas Mask**. Damage or wear to the canister holder which may prevent its being held securely in place; broken harness straps or fastening.

(7) **Hoods, Helmets, Blouses, or Full Suits**. Examine for rips and tears and seam integrity; examine the protective headgear, if required, for general condition, with emphasis on the suspension inside the headgear; examine the protective faceshield, if any, for cracks or breaks or impaired vision due to rebounding abrasive particles; ensure the protective screen is intact and secured correctly over the faceshield of abrasive blasting hoods and blouses.

(8) **Air Supply Systems**. Examine for integrity and good condition of the air supply lines and hoses, including attachments and end fittings; correct operation and condition of all regulators, valves, or other air-flow regulators.

b. **Cleaning, Sanitizing, and Storage**. Respirators shall be cleaned and sanitized according to manufacturer's instructions or as follows:

(1) Remove and discard all used cartridges and filters.

(2) Disassemble and hand wash the facepiece and parts in a warm water and mild dishwashing detergent solution. Strong cleaning agents can damage respirator parts. Temperatures above 43°C (110°F) and vigorous mechanical agitation shall be avoided. Solvents (e.g., paint removers), that can affect rubber and other parts, shall not be used. Ultrasonic or other suitable washers may be used per manufacturer's instructions.



(3) Sanitize the facepiece using one of the following methods:

(a) Immerse the facepiece for 2 minutes in a warm water (43° C or 110° F) solution of hypochlorite solution (approximately one milliliter of liquid laundry bleach to one liter of water); or

(b) Immerse the facepiece for 2 minutes in a warm water (43° C or 110° F) solution of iodine (add 0.8 milliliters of tincture of iodine to one liter of water); or

(c) Immerse the facepiece for 2 minutes in a warm water (43 °C or 110° F) solution of approved commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

(4) Rinse in clean warm water at a temperature of about 110°F. Do not exceed 122°F (50°C).

(5) Air-dry in a clean uncontaminated area in such a way as to prevent distortion of the facepiece. If drying cabinets are used, the drying temperature shall not exceed 122°F (50°C).

(6) Reassemble and reinspect respirator. If replacement parts are necessary, they shall be obtained and installed or the respirator shall be removed from service until the unserviceable parts are replaced. If parts are not available and cannot be replaced, discard the entire facepiece as it cannot be used without all parts in place. Interchange of parts is prohibited.

(7) Place respirator in a clean plastic bag or other container and seal. Zip-lock plastic bags are preferred. Ensure the respirator is completely dry before sealing to prevent mildew.

(8) Store flat in a clean, dry, uncontaminated area without crowding which may distort the respirator facepiece.

c. **Repair and Maintenance**

(1) Personnel shall not service/repair any respirators for which they have not been specifically trained.

(2) No work shall be performed on reducing valves, regulators or alarms of atmosphere-supplying respirators (e.g., air-line respirators and SCBAs). These items shall be returned to the manufacturer for all repairs and adjustments.

**B0610. ENTRY INTO IMMEDIATELY DANGEROUS TO LIFE OR HEALTH (IDLH) ATMOSPHERES**

a. **Respirators.** Should it become necessary to enter an IDLH atmosphere, only the following two types of respirators shall be used:

(1) A full facepiece, self-contained breathing apparatus (SCBA) operated in the pressure-demand mode.

(2) A full facepiece air-line respirator (operated in the pressure demand mode) equipped with an auxiliary self-contained air supply having a minimum rated service life of 15 minutes. The self-contained air supply of 15 minutes must be sufficient to ensure escape from the IDLH area. These may only be used to enter an IDLH atmosphere when connected to the supplied air

source (air-line). The auxiliary self-contained air supply may only be used for egress purposes. If the self-contained air supply (15-minute supply) is insufficient to ensure escape, then a SCBA must be used.

**NOTE:**

Although specified by chapter 074, Volume 3 of the Naval Ships Technical Manual, Gas Free Engineering, the equipment required in paragraphs B0610a(1) and (2) is not on the allowance lists of many ships. If the respirators required are not carried aboard ship, an Oxygen Breathing Apparatus (OBA) may be used for entry into atmospheres which are or are potentially IDLH if the following three conditions are met: underway, required by an emergency or for operational readiness reasons, and approved by the commanding officer. For situations which are not an emergency or operational readiness, entry shall be delayed until the ship returns to port and the entry may be made by an activity which has proper respiratory protection equipment. The above requirements do not apply to use of an OBA for damage control or fire fighting.

b. **Standby Personnel.** At least one trained standby person, with a suitable respirator per paragraph B0610a, shall be present in the nearest uncontaminated area. If the standby person enters the IDLH atmosphere, there shall be a second standby person with a suitable respirator in the uncontaminated area.

c. **Communications.** The standby person and those persons working in the IDLH atmosphere shall be able to communicate continuously with each other, i.e., visually, by telephone or radio or signal line.

d. **Rescue Equipment.** Persons who enter any IDLH atmosphere shall also be equipped with safety harnesses and lines that can be used to rescue them should they lose consciousness. A hoist shall be present for removing personnel from the IDLH atmosphere. For more information on rescue operations and gas free engineering, refer to chapter B8.

**CAUTION**

Tanks, voids, compartments and other confined spaces may contain atmospheres that are hazardous to life or health. This may be due to the presence of flammable or toxic air contaminants or the absence of sufficient oxygen to sustain life. No one shall be permitted to enter any such area until tests of the atmosphere are completed by a qualified gas free engineer and entry by personnel is authorized by competent authority.

**CAUTION**

Eductors located in remote spaces, if activated, can remove all breathing air. Ensure sufficient make-up air is provided and the space has adequate oxygen prior to entry in all educator equipped remote spaces.

**B0611. BREATHING AIR REQUIREMENTS**

a. **Air Quality.** Breathing air or the air output of pumps or compressors which are sources of breathing air for air-line respirators or SCBAs shall meet at least the minimum requirements for Grade D breathing air per reference B6-4.

b. **Ship's Low Pressure (LP) Air Compressors.** Ship's LP air is not suitable for use as breathing air unless specifically tested and certified to meet the purity standards in paragraph B0611a.

c. **Ambient Air Breathing Apparatus (AABA).** Air intakes for portable pumps such as the AABA shall be placed in an area free of contaminants. Periodic testing of the air quality from an AABA is not required. AABAs shall not be used for entry into IDLH atmospheres.

d. **Frequency of Testing.** The air output of compressors used by breathing air shall be tested quarterly. Quarterly testing of breathing air does not apply to the Navy Diving Program. Reference B6-5 addresses diving air requirements.

**B0612. RESPIRATORY PROTECTION TRAINING**

a. Proper respirator training is essential for personnel required to wear respirators and for supervisors of those wearing respirators. Documented training shall be given prior to respirator use and annually thereafter, and shall include the following topics:

(1) Proper fitting and wearing of the respirator, including how to perform user seal checks. Each person shall demonstrate the capability to don and wear each type of respirator to be worn in the performance of normal and emergency duties including situations in which the respirator malfunctions.

(2) Respirator capabilities and limitations

(3) Nature and degree of respiratory hazards and the effects from exposure to the hazardous atmosphere

(4) Proper respirator selection according to intended use

(5) Respirator care, cleaning, maintenance and storage

(6) Prohibition against facial hair and the proper use of contact lenses when wearing respirators

(7) How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.

b. Respiratory protection managers (RPM) on submarine tenders (AS), aircraft carriers (CV and CVN), amphibious assault ships (LHA and LHD), and selected combat logistics ships (AOE) shall attend Respiratory Protection Program Manager's course (CIN A-493-0072 or the latest course identification number). All other RPMs shall attend RPM course (CIN A-4J-0082). Courses are available from the Naval Occupational Safety and Health and Environmental Training Center.

c. Personnel assigned to issue respiratory protective equipment shall be trained on respirator selection, and care and maintenance prior to assignment and annually thereafter. The facility RPM should give the training.

d. See chapter A7 for training aids to assist in respiratory protection training.

**B0613. RESPIRATORY PROTECTION EVALUATION**

The industrial hygiene survey shall evaluate the need for the use of respirators.

**B0614. MEDICAL EVALUATIONS**

a. **Frequency.** The frequency of the evaluation shall be at least every 5 years below age 35, every 2 years from age 35 to 45, and changing to annually starting at age 45. Special evaluations shall be performed after prolonged absences from work for medical reasons or whenever a functional disability has been identified.

b. **Examiner.** A physician or a registered/occupational health nurse, physician's assistant, preventive medicine technician, or a hospital corpsman (independent duty technician, NEC 8425 or submarine medical technician, NEC 8402 only) under the supervision of a physician may conduct the medical evaluation. If all answers to the medical history questionnaire in appendix B6-D are negative and the examiner's consideration of the respirator to be used, frequency of respirator use, and type of work performed by the individual raises no other concerns, the examiner may certify that the individual is medically qualified to use that respirator. A "Yes" answer to any of these questions requires a referral to a physician if the condition is not stable and has not been previously evaluated. If the examiner's consideration of the respirator to be used, frequency of respirator use, and type of work performed by the individual raises other concerns, the individual must be referred to a physician for examination and disposition. Medical evaluation reports that restrict or do not permit respirator use should be signed by a physician. If the examiner's supervising physician is not on site, the examiner's consultation with the supervising physician shall be annotated in the medical record. All examiners shall be guided by the information in this section when evaluating an individual for respirator use.

c. **Medical History.** A medical history shall be obtained initially and the information should be reviewed and updated during subsequent examinations. A medical history questionnaire should be used to identify the following:

- (1) Previously diagnosed disease, particularly stressing cardiovascular, respiratory, or neurological diseases
- (2) Physiological problems or symptoms including claustrophobia
- (3) Problems associated with breathing during normal work activities
- (4) Past problems with respirator use
- (5) Past and current usage of medication
- (6) Any known physical deformities or abnormalities, including those that may interfere with respirator use
- (7) Previous occupations
- (8) Tolerance to tachycardia produced by inhalation of heated air.

As a minimum, the medical history questionnaire shall collect all the information requested in the model questionnaire in appendix B6-D Respirator User's Request Form, which may be adapted onto a SF-600 for medical record entry.

d. **Medical Examination**

(1) **General Considerations.** The examiner's evaluation of suitability of the individual for respirator use shall be based on his/her perception of the individual's work ability and not specifically on a diagnosis.

(2) **Specific Disqualifying Conditions.** Appendix B6-E contains disqualifying conditions for respirator use.

(3) **Work Restrictions.** To ensure the safety of the service member, the examiner shall designate work restrictions that are based on the person's medical history or current health condition and are not related specifically to respirator use. Conditions that might require special restrictions or replacement shall include history of heat stroke or heat exhaustion and skin conditions in cases where occlusive materials may result in symptoms or aggravation of the preexisting dermatitis.

(4) **Spirometry.** When properly performed by trained personnel on calibrated equipment, spirometry may be indicated for individuals when the examiner needs additional information as a result of medical history or clinical examination.

**B0615. SUBMARINE RESPIRATORY PROTECTION**

Respiratory protection is applicable to submarine operations in port. When respiratory protection is required at sea, the installed Emergency Air Breathing (EAB) System is the primary protection. Nuclear system welders may use metal fume respirators with their welding goggles.

Typically, respiratory protection is not used on submarines. If it is determined that a shipboard respiratory protection program is necessary, then comply with the following requirements:

a. Proper respirator training is essential for personnel required to wear respirators and for supervisors of those wearing respirators. Documented training shall be given prior to respirator use and annually thereafter, and shall include the following topics:

(1) Proper fitting and wearing of the respirator, including how to perform user seal checks. Each person shall demonstrate the capability to don and wear each type of respirator to be worn in the performance of normal and emergency duties including situations in which the respirator malfunctions.

(2) Respirator capabilities and limitations

(3) Nature and degree of respiratory hazards and the effects from exposure to the hazardous atmosphere

(4) Proper respirator selection according to intended use

(5) Respirator care, cleaning, maintenance and storage

(6) Prohibition against facial hair and the proper use of contact lenses when wearing respirators

(7) How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.

b. Respiratory protection managers (RPM) on submarines shall attend RPM course (CIN A-4J-0082). Courses are available from the Naval Occupational Safety and Health and Environmental Training Center.

c. Personnel assigned to issue respiratory protective equipment shall be trained on respirator selection, and care and maintenance prior to assignment and annually thereafter. The training should be given by the facility RPM.

d. See chapter A7 for training aids to assist in respiratory protection training.

e. **Responsibilities**

(1) **The commanding officer shall** appoint a respiratory protection manager(RPM).

(2) **The RPM shall:**

(a) Ensure that up-to-date command guidance exists on respiratory protection. Such guidance will normally be issued in this chapter; however, information unique to the command may be written into a command directive.

(b) Develop and maintain a roster of personnel in the respiratory protection.

(c) For respirators needed while underway (e.g., nuclear welders), provide guidance to the supply officer on the selection of proper types and stock levels of respiratory protective equipment. Sufficient respirators, spare parts, and expendable supplies (e.g., cartridges and filters) shall be stocked to conduct all operations.

(d) Ensure all respirators retained on board are properly maintained and stored.

(e) Ensure respirator users and supervisors of those wearing respirators are trained on respiratory protection requirements. This training shall be repeated annually. Recordkeeping for respirator fit-testing shall include type of respirator, brand name and model, method of test, test results, test date, and name of the instructor/tester and of the individual tested.

(f) Ensure appropriate fit testing is performed by the supporting IMA.

(g) Issue respirator user cards that will contain as a minimum:

1. Name/Social Security Number
2. Last respirator training date
3. Date medically qualified
4. Respirator successfully fit tested (brand, model, size)
5. Signature of fit tester/date/command.

This card will be needed for the supporting submarine Intermediate Maintenance Activity (IMA) to issue respirators. Submarine tenders or IMAs will print respirator user cards upon receipt of a work request.

(h) Coordinate with the supporting submarine IMA to determine what respirators (brand, model, and size) are available for issue.

(3) **Division officers shall:**

(a) Ensure that personnel performing work requiring respirators are assigned and qualified prior to use of respiratory protective equipment. Use the form in appendix B6-A to request medical qualification.

(b) Ensure that personnel have a current fit test and training prior to donning a respirator.

(c) For respirators needed while in port, ensure personnel obtain required respirator from the supporting submarine IMA.

(d) Ensure non-disposable respirators are returned to supporting submarine IMA when work is completed.

(e) Provide respirators needed while underway (e.g., nuclear systems welders).

(4) **The MDR shall:**

(a) Conduct or schedule the necessary preplacement medical clearance screening and periodic medical examinations of personnel required to use respirators (see paragraph B0614; the MDR is qualified to do these screening and medical evaluations.)

(b) Ensure that all exposure records and the results of all respirator user medical evaluations are entered into the individual's medical record

(c) Assist department heads/division officers in identifying in port work requiring respiratory protection.

(5) **Supporting submarine IMAs shall:**

(a) Upon request, schedule/provide initial or refresher training for the submarine RPM.

(b) Provide a standard submarine respiratory protection lesson plan to submarine RPMs for use in training their crews.

(c) Provide appropriate respirator fit-testing for the submarine respirator users while in port.

(d) Provide only the respirators needed by submarines in port. Respirators will only be issued to personnel with respirator user cards described in paragraph B0615a(2)(h).

(6) **Personnel required to wear a respirator to perform in-port work shall:**

(a) Wear the provided respirator when required and in a proper manner.

(b) Inspect the respirator before and after each use per paragraph B0609a.

(c) Perform a positive and negative respirator facepiece seal check prior to each use per paragraph B0607b.

(d) Report any malfunction of the respirator to their immediate supervisor.

(e) Prevent damage or loss of respiratory protective equipment.

f. **Procedures**

(R)

(1) Upon determination that planned work will require respiratory protection, supervisors shall assign personnel to perform the work. Those personnel who have not been previously assigned to work requiring respirator use shall be sent to the MDR for medical clearance qualification.

(2) The MDR shall complete the medical qualification using appendix B6-A or shall send the individual to the squadron medical officer for such qualification. Appendix B6-A and B6-D can be adapted onto a SF-600 for inclusion in the health record.

(3) Medically qualified personnel shall report to the tender/ submarine base for respirator issue. Those personnel who do not have a current (within 1 year) record of fit testing/training shall be fit-tested and trained by the respirator issuing facility according to the guidelines of paragraph B0612, prior to such issue. All personnel shall receive the following training prior to each issue:

(a) Respirator inspection procedures

(b) Positive and negative facepiece seal checks

(c) Respirator/cartridge service life

(d) Warning signs of respirator failure.

Respirators/cartridges shall be issued for the duration of the job.

(4) Upon completion of work, disposable respirators shall be disposed of; non-disposable respirators shall be returned to the supplying activity.

g. **Training.** Department heads, division officers, leading petty officers, and the MDR shall be trained annually on the recognition of work requiring respirators, respiratory protection procedures, and the proper use of respirators.

(R)

---

**CHAPTER B6**

**REFERENCES**

B6-1 29 Code of Federal regulations (CFR) 1910.134, Respiratory Protection (NOTAL)

B6-2 NAVSEA S9213-33-MMA-000/V, Radiological Controls for Ships.

B6-3 American National Standards Institute (ANSI) Z88.2-1992, Practices for Respiratory Protection. (Adopted by the Department of Defense and available from the Department of Defense Single Stock Point (DoD SSP) in



OPNAVINST 5100.19D  
05 October 2000

Philadelphia, PA) (Not required on board ship but listed as a pertinent reference) (NOTAL)

B6-4 American National Standards Institute/Compressed Gas Association, Inc.,  
Commodity Specification for Air, ANSI/CGA G-7.1-1997 (NOTAL)

B6-5 OPNAVINST 3150.27A, Navy Diving Program

**Appendix B6-A**

**MEDICAL CLEARANCE REQUEST**

**FOR OFFICIAL USE ONLY (when filled in)**

From: \_\_\_\_\_ Division Officer

To: Medical Department Representative

Subj: REQUEST FOR MEDICAL CLEARANCE FOR RESPIRATOR USE

1. The following individual is referred to you for subject clearance:

Name \_\_\_\_\_ SSN \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_

Supervisor \_\_\_\_\_ Date of Birth \_\_\_\_\_

Circle type(s) of respirator(s) to be used:

Air-purifying (non-powered)	Air-purifying (powered)
Hose mask (with blower)	Hose mask (without blower)
Air-line (demand)	Air-line (pressure-demand)
Air-line (continuous flow)	SCBA (closed circuit)
SCBA (open-circuit, demand)	SCBA (open-circuit, pressure-demand)

Level of Work Effort (Circle one): Light Moderate Heavy Strenuous

Extent of usage (Circle one):

Daily Occasionally but more than once a week Rarely or emergency only

Length of time of anticipated effort (hours per day) \_\_\_\_\_

Special work considerations (e.g., high places, elevated temperatures, hazardous material, protective clothing required, etc.)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
Division Officer Signature and Date

**FOR OFFICIAL USE ONLY (when filled in)**

OPNAVINST 5100.19D  
05 October 2000

From: Medical Department Representative  
To: \_\_\_\_\_ Division Officer

\_\_\_\_\_ is: (Circle one)

Medically qualified to use the above respirator with no restrictions.

Medically qualified to use the above respirator subject to the restrictions specified below.

Not medically qualified to use the above respirator.

Restrictions \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
MDR Signature and Date

Copy to:  
Respiratory Protection Officer

Appendix B6-B

TYPES OF RESPIRATORS

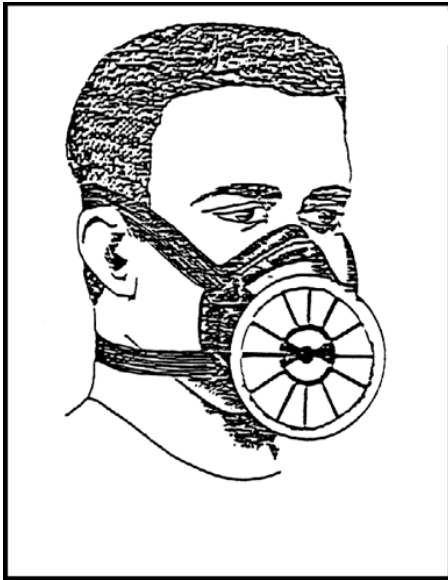


Illustration I - Reusable  
Facepiece/Replaceable  
Filter

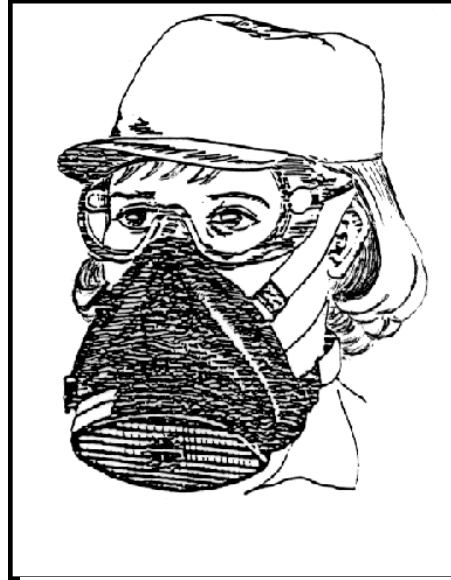


Illustration II - Dis-  
posable Respirator

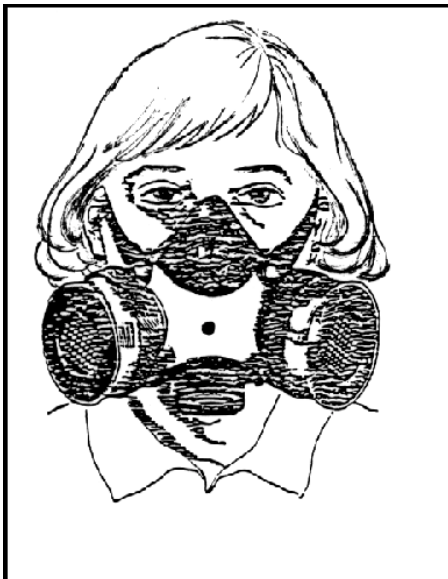


Illustration III - Reusable  
Facepiece/Replaceable Car-  
tridge

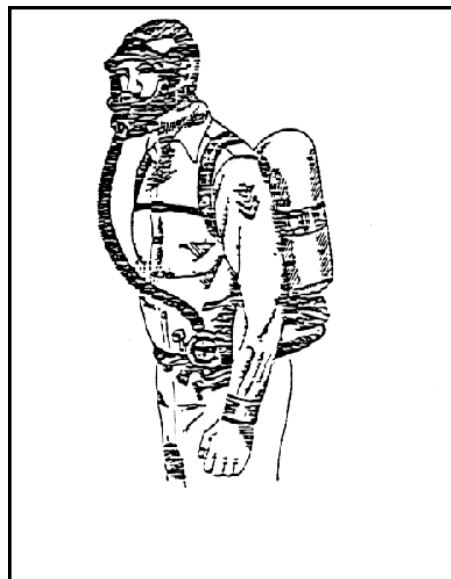


Illustration IV -  
Self-Contained Breathing  
Apparatus

**Appendix B6-C**

**Qualitative Respirator Fit Test Protocols**

**I. Isoamyl Acetate Fit Test**

- a. The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.
- b. Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors.
- c. After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.
- d. A copy of the test exercises and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.
- e. Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure isoamyl acetate (IAA). The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.
- f. Allow 2 minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be an appropriate time to talk with the test subject; to explain the fit test, the importance of his/her cooperation, and the purpose for the test exercises; or to demonstrate some of the exercises.
- g. If at any time during the test, the subject detects the banana-like odor of IAA, the test is failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.
- h. If the test is failed, the subject shall return to the selection room and remove the respirator. The test subject shall repeat the odor sensitivity test, select and put on another respirator, return to the test area and again begin the fit test procedure described in Ia through g above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.
- i. If the subject passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.
- j. When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent

tests. The used towels shall be kept in a self-sealing plastic bag to keep the test area from being contaminated.

II. **Saccharin Solution Aerosol Protocol**. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

a. **Taste threshold screening**. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.

1. During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches in diameter by 14 inches tall with at least the front portion clear and that allows free movements of the head when a respirator is worn.

2. The test enclosure shall have a 3/4 -inch (1.9 cm) hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

3. The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his/her slightly open mouth with tongue extended. The subject is instructed to report when he/she detects a sweet taste.

4. Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. The nozzle is directed away from the nose and mouth of the person. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

5. The threshold check solution is prepared by dissolving 0.83 gram of sodium saccharin USP in 100 ml of warm water. It can be prepared by putting 1 ml of the fit test solution (see (b)(5) below) in 100 ml of distilled water.

6. To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.

7. Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted. If the test subject reports tasting the sweet taste during the 10 squeezes, the screening test is completed. The taste threshold is noted as 10 regardless of the number of squeezes actually completed.

8. If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the second 10 squeezes, the screening test is completed. The taste threshold is noted as 20 regardless of the number of squeezes actually completed.

9. If the second response is negative, 10 more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the third set of 10 squeezes, the screening test is completed. The taste threshold is noted as 30 regardless of the number of squeezes actually completed.

10. The test conductor will take note of the number of squeezes required to solicit a taste response.

11. If the saccharin is not tasted after 30 squeezes (step 10), the test subject is unable to taste saccharin and may not perform the saccharin fit test. Note to paragraph 3. (a): If the test subject eats or drinks something sweet before the screening test, he/she may be unable to taste the weak saccharin solution.

12. If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

13. Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

14. The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every 4 hours.

b. Saccharin solution aerosol fit test procedure

1. The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

2. The fit test uses the same enclosure described in IIb1 above.

3. The test subject shall don the enclosure while wearing the respirator selected in section Ib of this appendix. The respirator shall be properly adjusted and equipped with a particulate filter(s).

4. A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

5. The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 ml of warm water.

6. As before, the test subject shall breathe through the slightly open mouth with tongue extended, and report if he/she tastes the sweet taste of saccharin.

7. The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of saccharin fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test. A minimum of 10 squeezes is required.

8. After generating the aerosol, the test subject shall be instructed to perform the exercises in section Ie of this appendix.

9. Every 30 seconds the aerosol concentration shall be replenished using one half the original number of squeezes used initially (e.g., 5, 10 or 15).

10. The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected. If the test subject does not report tasting the saccharin, the test is passed.

11. If the taste of saccharin is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

12. Since the nebulizer has a tendency to clog during use, the test operator must make periodic checks of the nebulizer to ensure that it is not clogged. If clogging is found at the end of the test session, the test is invalid.

**III. Bitrex TM (Denatonium Benzoate) Solution Aerosol Qualitative Fit Test Protocol.** The Bitrex TM (Denatonium benzoate) solution aerosol QLFT protocol uses the published saccharin test protocol because that protocol is widely accepted. Bitrex is routinely used as a taste aversion agent in household liquids which children should not be drinking and is endorsed by the American Medical Association, the National Safety Council, and the American Association of Poison Control Centers. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

a. **Taste Threshold Screening.** The Bitrex taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of Bitrex.

1. During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches (30.5 cm) in diameter by 14 inches (35.6 cm) tall. The front portion of the enclosure shall be clear from the respirator and allow free movement of the head when a respirator is worn.

2. The test enclosure shall have a 3/4 inch (1.9 cm) hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

3. The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his or her slightly open mouth with tongue extended. The subject is instructed to report when he/she detects a bitter taste.

4. Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the Threshold Check Solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

5. The Threshold Check Solution is prepared by adding 13.5 milligrams of Bitrex to 100 ml of 5% salt (NaCl) solution in distilled water.

6. To produce the aerosol, the nebulizer bulb is firmly squeezed so that the bulb collapses completely, and is then released and allowed to fully expand.

7. An initial 10 squeezes are repeated rapidly and then the test subject is asked whether the Bitrex can be tasted. If the test subject reports tasting the bitter taste during the 10 squeezes, the screening test is completed. The taste threshold is noted as 10 regardless of the number of squeezes actually completed.

8. If the first response is negative, 10 more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the second 10 squeezes, the screening test is completed. The taste threshold is noted as 20 regardless of the number of squeezes actually completed.

9. If the second response is negative, 10 more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the third set of 10



squeezes, the screening test is completed. The taste threshold is noted as 30 regardless of the number of squeezes actually completed.

10. The test conductor will take note of the number of squeezes required to solicit a taste response.

11. If the Bitrex is not tasted after 30 squeezes (step 10), the test subject is unable to taste Bitrex and may not perform the Bitrex fit test.

12. If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

13. Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

14. The nebulizer shall be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoon or at least every 4 hours.

**b. Bitrex Solution Aerosol Fit Test Procedure**

1. The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

2. The fit test uses the same enclosure as that described in IIIa(1) above.

3. The test subject shall don the enclosure while wearing the respirator selected according to section Ib of this appendix. The respirator shall be properly adjusted and equipped with any type particulate filter(s).

4. A second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

5. The fit test solution is prepared by adding 337.5 mg of Bitrex to 200 ml of a 5 percent salt (NaCl) solution in warm water.

6. As before, the test subject shall breathe through his or her slightly open mouth with tongue extended, and be instructed to report if he/she tastes the bitter taste of Bitrex.

7. The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of the fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test.

8. After generating the aerosol, the test subject shall be instructed to perform the exercises in section Ie of this appendix.

9. Every 30 seconds the aerosol concentration shall be replenished using one half the number of squeezes used initially (e.g., 5, 10 or 15).

10. The test subject shall indicate to the test conductor if at any time during the fit test the taste of Bitrex is detected. If the test subject does not report tasting the Bitrex, the test is passed.

11. If the taste of Bitrex is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator shall be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

IV. **Irritant Smoke (Stannic Chloride) Protocol**. This qualitative fit test uses a person's response to the irritating chemicals released in the smoke produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

a. **General Requirements and Precautions**

1. The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

2. Only stannic chloride smoke tubes shall be used for this protocol.

3. No form of test enclosure or hood for the test subject shall be used.

4. The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.

5. The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

b. **Sensitivity Screening Check**. The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

1. The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

2. The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

3. The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

b. **Irritant Smoke Fit Test Procedure**

1. The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).

2. The test subject shall be instructed to keep his/her eyes closed.

3. The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.

4. If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

5. The exercises identified in section 1e of this appendix shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of 6 inches.

6. If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

7. Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

8. If a response is produced during this second sensitivity check, then the fit test is passed.

**Appendix B6-D**  
**MEDICAL QUESTIONNAIRE FOR POTENTIAL RESPIRATOR USERS**

**Part 1**

1. Today's date: \_\_\_\_\_
2. Your name: \_\_\_\_\_
3. Your age (to nearest year): \_\_\_\_\_
4. Your sex (circle one): Male/Female
5. Your height (Feet and Inches): \_\_\_\_\_
6. Your weight (Pounds): \_\_\_\_\_
7. Your job title/rate: \_\_\_\_\_
8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code):  
\_\_\_\_\_
9. Circle the type of respirator you will use (you can check more than one category):
  - a. N, R, or P disposable respirator (filter-mask, non-cartridge type only)
  - b. N, R, or P non-disposable respirator (filter-mask, with cartridges)
  - c. Other type of cartridge respirators (for example, dust, fume, mist, or organic vapor respirators)
  - d. Other types of respirators (for example, powered-air purifying, supplied-air, or self-contained breathing apparatus).
10. Have you ever/previously worn a respirator (circle one): Yes/No  
If yes, what type(s):

**Part 2**

Questions 1 through 9 below must be answered by every person who has been selected to use any type of respirator (please circle yes or no).

1. Do you currently smoke tobacco, or have you smoked tobacco in the last month: Yes/No
2. Have you ever had any of the following conditions?
  - a. Seizures (fits): Yes/No
  - b. Diabetes (sugar disease): Yes/No
  - c. Allergic reactions that interfere with your breathing: Yes/No
  - d. Claustrophobia (fear of closed-in places): Yes/No
  - e. Trouble smelling odors: Yes/No

Appendix B6-D

Enclosure (1)

3. Have you ever had any of the following pulmonary or lung problems?

- |  |        |
|--|--------|
| a. Asbestosis:   | Yes/No |
| b. Asthma:   | Yes/No |
| c. Chronic bronchitis:                                 | Yes/No |
| d. Emphysema:  | Yes/No |
| e. Pneumonia:  | Yes/No |
| f. Tuberculosis:                                       | Yes/No |
| g. Silicosis:  | Yes/No |
| h. Pneumothorax (collapsed lung):                      | Yes/No |
| i. Lung cancer:  | Yes/No |
| j. Broken ribs:  | Yes/No |
| k. Any chest injuries or surgeries:                    | Yes/No |
| l. Any other lung problem that you've been told about: | Yes/No |

4. Do you currently have any of the following symptoms of pulmonary or lung illness?

- |  |        |
|--|--------|
| a. Shortness of breath:  | Yes/No |
| b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: | Yes/No |
| c. Shortness of breath when walking with other people at an ordinary pace on level ground:       | Yes/No |
| d. Have to stop for breath when walking at your own pace on level ground:                        | Yes/No |
| e. Shortness of breath when washing or dressing yourself:  | Yes/No |
| f. Shortness of breath that interferes with your job:  | Yes/No |
| g. Coughing that produces phlegm (thick sputum):   | Yes/No |
| h. Coughing that wakes you early in the morning:   | Yes/No |
| i. Coughing that occurs mostly when you are lying down:  | Yes/No |
| j. Coughing up blood in the last month:  | Yes/No |
| k. Wheezing:   | Yes/No |
| l. Wheezing that interferes with your job:   | Yes/No |
| m. Chest pain when you breathe deeply:   | Yes/No |

- n. Any other symptoms that you think may be related to lung problems:  
Yes/No
5. Have you ever had any of the following cardiovascular or heart problems?
- a. Heart attack: Yes/No
  - b. Stroke: Yes/No
  - c. Angina: Yes/No
  - d. Heart failure: Yes/No
  - e. Swelling in your legs or feet (not caused by walking): Yes/No
  - f. Heart arrhythmia (heart beating irregularly): Yes/No
  - g. High blood pressure: Yes/No
  - h. Any other heart problem that you've been told about: Yes/No
6. Have you ever had any of the following cardiovascular or heart symptoms?
- a. Frequent pain or tightness in your chest: Yes/No
  - b. Pain or tightness in your chest during physical activity:  
Yes/No
  - c. Pain or tightness in your chest that interferes with your job:  
Yes/No
  - d. In the past 2 years, have you noticed your heart skipping or missing  
a beat: Yes/No
  - e. Heartburn or indigestion that is not related to eating: Yes/No
  - f. Any other symptoms that you think may be related to heart or circula-  
tion problems: Yes/No
7. Do you currently take medication for any of the following problems?
- a. Breathing or lung problems: Yes/No
  - b. Heart trouble: Yes/No
  - c. Blood pressure: Yes/No
  - d. Seizures (fits): Yes/No
8. If you've used a respirator, have you ever had any of the following prob-  
lems? (If you've never used a respirator, check the following space and go to  
question 9:)
- a. Eye irritation: Yes/No
  - b. Skin allergies or rashes: Yes/No
  - c. Anxiety: Yes/No
  - d. General weakness or fatigue: Yes/No

- e. Any other problem that interferes with your use of a respirator:  
Yes/No

9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes/No

### Part 3

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10. Have you ever lost vision in either eye (temporarily or permanently):  
Yes/No

11. Do you currently have any of the following vision problems?

- a. Wear contact lenses: Yes/No  
b. Wear glasses: Yes/No  
c. Color blind: Yes/No  
d. Any other eye or vision problem: Yes/No  
e. Any other eye or vision problem: Yes/No

12. Have you ever had an injury to your ears, including a broken ear drum:  
Yes/No

13. Do you currently have any of the following hearing problems?

- a. Difficulty hearing: Yes/No  
b. Wear a hearing aid: Yes/No  
c. Any other hearing or ear problem: Yes/No

14. Have you ever had a back injury: Yes/No

15. Do you currently have any of the following musculoskeletal problems?

- a. Weakness in any of your arms, hands, legs, or feet: Yes/No  
b. Back pain: Yes/No  
c. Difficulty fully moving your arms and legs: Yes/No  
d. Pain or stiffness when you lean forward or backward at the waist: Yes/No  
e. Difficulty fully moving your head up or down: Yes/No  
f. Difficulty fully moving your head side to side: Yes/No  
g. Difficulty bending at your knees: Yes/No  
h. Difficulty squatting to the ground: Yes/No

- i. Climbing a flight of stairs or a ladder carrying more than 25 lbs.:  
Yes/No
- j. Any other muscle or skeletal problem that interferes with using a  
respirator:  
Yes/No

**Part 4**

(Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire)

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen: Yes/No

If yes, do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions:  
Yes/No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: Yes/No

If yes, name the chemicals if you know them:

3. Have you ever been a member of a HAZMAT spill response team, or a member of a HAZMINCEN: Yes/No

4. Have you ever worked with any of the materials, or under any of the conditions, listed below:

- a. Asbestos: Yes/No
- b. Silica (e.g., in sandblasting): Yes/No
- c. Tungsten/cobalt (e.g., grinding or welding this material):  
Yes/No
- d. Beryllium: Yes/No
- e. Aluminum: Yes/No
- f. Coal (for example, mining): Yes/No
- g. Iron: Yes/No
- h. Tin: Yes/No
- i. Dusty environments: Yes/No
- j. Any other hazardous exposures: Yes/No

If yes, describe these exposures:



5. List any second jobs or side businesses you have:

6. List your previous occupations:

7. List your current and previous hobbies:

8. Have you been in other military services? Yes/No

Do you suspect that you were exposed to biological or chemical agents while in the military or in a military operation: Yes/No

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes/No

If yes, name the medications if you know them:

10. Will you be using any of the following items with your respirator(s)?

a. HEPA Filters: Yes/No

b. Canisters (for example, gas masks): Yes/No

c. Cartridges: Yes/No

11. How often are you expected to use the respirator(s) (circle yes or no for all answers that apply to you)?:

a. Escape only (no rescue): Yes/No

b. Emergency rescue only: Yes/No

c. Less than 5 hours per week: Yes/No

d. Less than 2 hours per day: Yes/No

e. 2 to 4 hours per day: Yes/No

f. Over 4 hours per day: Yes/No

12. During the period you are using the respirator(s), is your work effort (circle):

a. Light: Yes/No Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1-3 lbs..) or controlling machines.

If yes, how long does this period last during the average shift (number of hours):

b. Moderate: Yes/No Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs..) at trunk level; walking on a level surface about 2 mph or down a 5-degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs..) on a level surface.

If yes, how long does this period last during the average shift (number of hours):

c. Heavy: Yes/No Examples of heavy work are lifting a heavy load (about 50 lbs..) from the floor to your waist or shoulder; working on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs..).

If yes, how long does this period last during the average shift (number of hours):

13. Will you be wearing protective clothing and/or equipment (other than the respirator) when you're using your respirator: Yes/No

If ``yes,`` describe this protective clothing and/or equipment:

14. Will you be working under hot conditions (temperature exceeding 90 deg. F: Yes/No

15. Will you be working under humid conditions: Yes/No

16. Describe the work you'll be doing while you're using your respirator(s):

17. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):

Name of the first toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift

Name of the second toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift:

Name of the third toxic substance:

Estimated maximum exposure level per shift:

Duration of exposure per shift:

The name of any other toxic substances that you'll be exposed to while using your respirator:

18. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):

19. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security):

**Appendix B6-E**

**SPECIFIC RESPIRATOR DISQUALIFYING CONDITIONS**

1. **Facial Deformities and Facial Hair.** Facial deformities or presence of excessive hair or other conditions that interfere with proper sealing of the respirator shall disqualify the applicant. Questionably disqualifying conditions shall be evaluated by fit testing.
2. **Use of Prescription Eyeglasses or Contact Lenses.** Individuals with prescription eyeglasses who are required to wear a full-facepiece respirator shall use special frames, purchased by the Navy, for their glasses that do not interfere with the facepiece seal. Special visual acuity and visual field requirements shall depend upon the nature of the work to be performed. Respirator users may wear soft contact lenses while using a respirator.
3. **Hearing Requirements.** These requirements shall be dependent upon the nature of the work to be performed. The service member's hearing shall be adequate to ensure communication and response to instructions and alarm systems. Individuals with perforated tympanic membranes cannot wear respirators in hazardous areas where inhalation or absorption of toxic materials or vapors through the perforation may occur. Existence of perforation by itself shall not immediately disqualify the individual from respirator use, but the examiner shall consider both the environmental conditions of the job and possible specific safety controls before reaching a final decision. Possible specific safety controls may also be recommended by the safety officer.
4. **Respiratory Diseases.** Disease affecting pulmonary functions may prevent respirator use. Significant restrictive or obstructive disease or perfusion disorders may preclude approval for use. Assessment as to the degree of disability shall depend upon the patient's history and clinical findings of X-ray and spirometry, where indicated. Special analysis shall be required when perfusion disorders are suspected.
5. **Cardiovascular Diseases.** Symptomatic coronary artery disease, significant arrhythmias, or history of recent myocardial infarction shall disqualify the service member from respirator use. Occurrence of frequent premature ventricular contractions (PVCs) with elevated pulse rates shall be considered disqualifying. The examiner, using clinical judgment, shall decide if individuals with uncontrolled hypertension or related symptoms and individuals on blood pressure or cardiovascular medications may wear respirators.
6. **Endocrinal Disorder.** General work limitations and restrictions identified for other work activities also apply for respirator use. If the service member may suffer sudden loss of consciousness or response capability, the examiner shall determine if the service member may use a respirator.
7. **Neurological Disability.** Inability to perform coordinated movement and conditions affecting response and consciousness shall disqualify the service member. Epilepsy, controlled on medication, should not be disqualifying if the patient has been seizure-free for 1 year and has no significant side effects from medication.
8. **Medications.** The examiner shall use clinical judgment to determine if an individual should be denied use of a respirator due to a history of excessive use or problems related to prescription and non-prescription drugs, including alcohol, that affect judgment, performance, or reliability or alter the state of awareness or consciousness.

9. **Psychological Condition.** The examiner shall decide if a service member with a psychological condition that results in poor judgment or reliability should be disqualified. A history of claustrophobia may disqualify the service member. The examiner shall consider the severity of the individual's claustrophobia, and may recommend field-testing for the individual, prior to approving or denying use of the respirator. Clinical history or indication of severe anxiety shall also be considered by the examiner in determining an individual's ability to use respirators.

CHAPTER B7

ELECTRICAL SAFETY

**B0701. DISCUSSION**

This chapter provides guidance to assist in the identification of electrical hazards, and to prevent mishaps that could cause injuries and extensive damage to shipboard equipment and may compromise the ship's mission capabilities. Reference B7-1, chapter 300 is the primary reference for detailed technical guidance on electrical hazards and the potential for electric shock. Work involving electric tools, equipment and systems is inherently dangerous. Always use the principles of operational risk management (ORM) when dealing with electricity. Details of ORM are found in reference B7-2.

**B0702. RESPONSIBILITIES**

a. The commanding officer shall authorize all work on energized equipment per reference B7-1.

b. The safety officer shall:

(1) Ensure electrical/electronic indoctrination training is provided for all newly reporting personnel per paragraph B0708. Coordinate with the electrical officer/electronics material officer to provide this training.

(2) Complete training per B0708d.

c. The electrical officer/electronic maintenance officer shall:

(1) Establish an electrical tool issue room per B0707.

(2) Ensure that applicable maintenance and repair is conducted per reference B7-3. (R)

(3) Ensure that the on-board CPR instructor is certified per B0708.

(4) Ensure that all electrical tools/equipment received on board are authorized for shipboard use. Reference B7-1 contains guidance on determining suitability for shipboard use.

d. The supply officer shall ensure that all electrical tools/equipment received on board are turned over to the electrical tool issue room (electrical division for submarines) for a safety inspection prior to issue.

e. Division officers shall:

(1) Ensure that assigned personnel are trained per paragraph B0708.

(2) Ensure that all portable electrical equipment is visually inspected prior to use, and is electrically safety checked quarterly. Reference B7-1 (paragraph 300-2.7) contains detailed technical guidance on portable electric equipment.

(3) Ensure that all personal electrical/electronic equipment is authorized for shipboard use. Reference B7-1 contains guidance on

determining suitability for shipboard use. The electrical safety checks for personal electrical/electronic equipment are not required.

(4) Ensure that required personnel receive CPR training per paragraph B0708.

(5) Ensure that items open purchased or received from Navy supply are authorized for shipboard use and electrically safety checked prior to use. Reference B7-1 contains guidance on determining suitability for shipboard use.

(6) Ensure that all personnel experiencing electrical shock report to medical.

f. **All hands shall:**

(1) Request permission from their division officer prior to bringing personal electrical/electronic equipment aboard. This requirement does not apply to battery-operated equipment incapable of being plugged into ships' electrical service.

(2) Report any condition, equipment or material that is believed to be unsafe.

(3) Report any electrical shock to their division officer.

**B0703. ELECTRICAL SAFETY ELEMENTS**

a. Working on de-energized equipment. (B0704)

b. Working on energized equipment. (B0705)

c. Personal protective equipment (PPE). (B0706)

d. Portable electrical tool issue. (B0707)

e. General precautions for portable electrical equipment. (Chapters C9 and D5)

f. Training. (B0708)

g. Safety standards implementation. (Chapters C9 and D5 list the Electrical Safety Standards).

**B0704. WORKING ON DE-ENERGIZED EQUIPMENT**

Completely de-energizing equipment will ensure safety from electrical hazards. Opening the power supply circuit breaker or switch and/or removing the fuses should de-energize electrical equipment. Some equipment has more than one source of power that requires opening multiple breakers or switches and/or removing multiple fuses. Tag out the circuit breaker switches and fuses. Check the equipment with a voltmeter to ensure that it is completely de-energized before maintenance begins.

a. For technical requirements concerning work on de-energized equipment, see reference B7-1, paragraph 300-2.4.

- b. For tag out procedures, see reference B7-3.

**B0705. WORKING ON ENERGIZED EQUIPMENT**

a. **Approval Procedures.** Do not disassemble or maintain energized electrical equipment without approval of such action by the commanding officer, or in his/her absence, the command duty officer (CDO). Exceptions to this policy are those cases where approved instructions issued by higher authority (equipment technical manuals, Planned Maintenance System (PMS), or an established troubleshooting procedure) permit opening or inspecting equipment in the course of performing maintenance, routine testing, taking measurements, or making adjustments that require equipment to be energized. Commanding officer permission is not required when checking equipment or circuits to verify de-energization.

b. **Energized Circuit Working Procedures.** Reference B7-1, paragraph 300-2.5.2 contains technical procedures for working on energized equipment.

- c. Damaged equipment shall be considered energized.

**B0706. PERSONAL PROTECTIVE EQUIPMENT (PPE)**

a. Use only gloves marked with a colored label indicating the usage limitations. Reference B7-1, Table 300-2-1 contains further information on stock numbers, maximum safe voltage usage, and label colors.

b. Stow rubber insulating gloves in the box in which they came. Perform PMS on the gloves prior to stowage. Stow other rubber electrical safety protection equipment in a clean, dry, oil-free location. Take care not to fold the gloves, as folding will frequently result in cracks that will greatly reduce insulating capability of the material. For further information on glove damage causes, inspection, and maintenance refer to reference B7-1, paragraph 300-2.5.3.

**B0707. PORTABLE ELECTRICAL TOOL ISSUE (Not applicable to submarines)**

a. Surface ships shall establish a centralized portable electrical tool issue room for issue of portable electrical tools. Larger ships may have more than one tool issue room.

b. Personnel assigned to issue portable electric tools shall perform visual inspections and quarterly safety testing of equipment per reference B7-1 (paragraph 300-2.7.5) prior to issue to personnel. Reference B7-1 (paragraph 300-2.7) contains additional technical guidance on portable electric equipment.

c. Prior to issue of portable electric tools, the personnel assigned to issue tools shall brief the tool users on general precautions for portable electrical equipment per B0708, as well as issue any required personal protective equipment.

d. Certain divisions or work centers (those that contain electrical/electronic ratings) may retain selected electrical tools or equipment in their permanent custody. These divisions will perform safety checks on their equipment at the required frequency. These divisions shall not issue portable electrical tools to other divisions or work centers.



e. Housekeeping items such as vacuum cleaners and floor buffers need not be retained in the electrical tool issue room.

f. Unsafe electrical tools should be clearly marked "OOC", be rendered incapable of being energized, and be kept in locked storage separate from the other tools. The only exceptions should be for those tools in which immediate repair is to be accomplished.

**B0708. TRAINING**

a. All personnel, when reporting aboard, shall receive indoctrination on basic electrical safety, including the requirements regarding use of personal protective equipment. Reference B7-1 may be used as a source of training material. The training shall also include recognizing symptoms of electrical shock, electrical shock trauma, and emergency first aid responder techniques.

b. Each ship shall have a certified American Red Cross/American Heart Association CPR instructor on board. At least 50 percent of all electrical/electronics associated ratings shall be certified in basic life support.

c. Personnel who man the portable electrical tool issue room shall complete the Electrical Tool Issue Room Watchstation 302 in the Safety Programs Afloat Personal Qualifications Standard (PQS), NAVEDTRA 43460-4A.

d. The safety officer shall complete watchstation 304 of the Safety Programs Afloat PQS within 16 weeks of assignment.

---

**CHAPTER B7**

**REFERENCES**

B7-1 Naval Ship's Technical Manual (NSTM) chapters 300, 302, 310, 313, 320, 330 and 400 (NOTAL)

B7-2 OPNAVINST 3500.39, Operational Risk Management (NOTAL)

R) B7-3 NAVSEA S0400-AD-URM-010/TUM, "Tag-Out User's Manual"

## CHAPTER B8

### GAS FREE ENGINEERING

#### **B0801. DISCUSSION**

a. No routine hazard, with the exception of ordnance, is as dangerous as the presence of potentially lethal atmospheres in ship's spaces. In many instances, potentially harmful gases or vapors are present in such a low concentration (parts per million (ppm)) that no adverse conditions are created. By design a ship has many confined spaces (especially tanks and voids) in which a multitude of both toxic and non-toxic gas or vapor creating substances and operations are used in the normal operation of the ship. Hazardous atmospheres may be created that can explode or cause asphyxiation. Compounding the problem is that many gases or vapors are not detected by the human ability of smell, and personnel attempting to save a fallen shipmate may themselves be overcome and killed by undetected vapors. It is for these reasons that every confined space shall be considered hazardous and entry into or work in or on such spaces is prohibited until the space has been gas free tested by qualified gas free engineering personnel. This is known as Gas Free Engineering (GFE).

b. Consult reference B8-1 (Gas Free Engineering) for further details concerning specific procedures and related safety precautions.

#### **B0802. PRECAUTIONS**

a. All hands shall:

(1) Notify workcenter supervisor prior to entering any unventilated, non-occupied space designated to store hazardous or toxic materials or any sealed space, verify that such a space was gas free tested and certified safe for entry and/or work by the appropriate gas free engineering personnel prior to entry, and comply with the requirements of the gas free engineering certificates posted outside the space.

(2) Notify the workcenter supervisor before any new space is used to store hazardous or toxic material or of any spill of hazardous or toxic material.

(3) When working in any confined space, always work with an observer or an attendant monitoring the work from outside the space. Maintain communication with personnel outside the space. The type and frequency of communication shall be specified by the GFE based on the nature of the space, the operation, and the degree of hazard.

b. Workcenter supervisor shall notify chain of command and gas free engineer (GFE) to obtain approval:

(1) prior to entering any unventilated, non-occupied space designated to store hazardous or toxic materials or any sealed space and

(2) before any new space is used to store hazardous or toxic material or of any spill of hazardous or toxic material.

c. If a person is seen unconscious in any space, no one is to enter that space without appropriate respiratory protective equipment and a backup assistant.

**B0803. Gas Free Engineering Subsections**

The following subsections apply to gas free engineering:

- a. Confined space entry procedures, including testing. (reference B8-1, paragraphs 074-19.4 through 19.15)
- b. Personal protective equipment. (reference B8-1, paragraphs 074-19.7 through 19.9)
- c. Ventilation requirements. (reference B8-1, section 074-21)
- d. Emergency and rescue procedures. (reference B8-1, section 074-25)
- e. Instrumentation, including calibration and maintenance. (reference B8-1, appendix K and L)
- f. Training of ship's force and gas free engineering personnel. (reference B8-1, paragraph 074-18.7 through 18.9)

---

**CHAPTER B8**

**REFERENCES**

- B8-1 Naval Ship's Technical Manual, NAVSEA S9086-CH-STM-030/CH-074 V3, "Gas Free Engineering"

**CHAPTER B9**

**RADIATION SAFETY**

**B0901. DISCUSSION**

a. This chapter outlines policies and procedures designed to minimize personnel exposure to radiation from sources other than nuclear power systems and nuclear weapons that have their own radiation protection and control programs. Per paragraph A0103b, the Director, Naval Nuclear Propulsion Program is responsible for the control of radiation and radioactivity associated with naval nuclear propulsion plants. As such, the requirements of this chapter do not apply to the Naval Nuclear Propulsion Program. Issues concerning radiation and radioactivity associated with naval nuclear propulsion plants should be addressed via the chain of command. This chapter also excludes those individuals, who as patients, must undergo diagnostic or therapeutic procedures

b. Radiation is commonly divided into two categories: ionizing and non-ionizing. Radiation, with sufficient energy to strip electrons from atoms in the media through which it passes, is known as ionizing radiation. Less energetic radiation incapable of such electron stripping is termed non-ionizing radiation. Potentially hazardous sources of radiation exist aboard Navy ships. Ionizing radiation sources include radioactive material and x-ray generating equipment, while lasers, radar, and communications equipment emit non-ionizing radiation.

(R)

**B0902. RESPONSIBILITIES**

a. The commanding officer shall:

(1) Appoint laser systems safety officer (LASSO) and radiological systems safety officers, as needed, and ensure that they are properly trained per references B9-1 and B9-2.

(R)

(2) Request a radiation hazard (RADHAZ) survey when:

(a) Emitter systems have been added, relocated, or upgraded as a result of scheduled SHIPALT or ALT installation since the last RADHAZ survey.

(b) Watchstations or work areas are moved or established in the proximity of emitter systems.

(c) Gasoline storage or transfer stations are relocated in the proximity of emitter systems.

(d) Personnel are injured as a result of exposure to radio frequency radiation (RFR) and the command requires assistance in re-evaluating the current RADHAZ survey.

(e) The current RADHAZ survey was conducted prior to 1995.

(3) Submit a confirmation letter to COMNAVSEASYS COM (Code SEA 05K2B), stating that the recommended control measures provided in the Hazards of Electromagnetic Radiation to Personnel (HERP) survey report have been implemented to obtain a NAVSEASYS COM letter of certification, per reference B9-3.

Enclosure (1)

(4) Ensure mishaps and incidents involving radiation are investigated and reported per the governing references listed in paragraph B0903. If a mishap report is required, use chapter A6 for guidance.

**b. Division officers responsible for workcenters and areas with identified radiation hazards shall:**

(1) Ensure radiation (ionizing, RF, and laser) hazard areas are posted with the appropriate warning signs and deck markings.

(2) Ensure that personnel receive medical surveillance as identified in the baseline industrial hygiene.

**c. Leading petty officers and duty section leaders shall** provide awareness and hazard recognition training for all personnel assigned to work or stand duty in RADHAZ areas to prevent accidental exposure.

**B0903. GUIDANCE**

**a. Ionizing Radiation**

R) (1) **Industrial Radiography**. Sources of ionizing radiation are used onboard tenders and in shipyards for non-destructive testing (NDT) of materials. X-ray machines are used on carriers for NDT procedures conducted on aircraft. The ship's radiological safety officer (RSO) is responsible for all aspects of the program described in the governing instructions.

(a) **Governing Instructions**. NAVSEA S0420-AA-RAD-010 (Reference B9-2)

(b) **POC**. NAVSEADET Radiological Affairs Support Office (RASO).  
COMM: (757) 887-4692 DSN: 953-4692 FAX: (757) 887-3235

R) (2) **Medical Radiography**. Medical and dental x-ray facilities must be surveyed every 2 years by a Radiation Health Officer (RHO). The medical officer shall request the survey from the nearest medical activity with a RHO or contact the Navy Environmental Health Center (NAVENVIRHLTHCEN), Radiation Health Team.

(a) **Governing Instructions**. BUMEDINST 6470.22 (Reference B9-1)

R) (b) **POC**. Radiation Health Team, Navy Environmental Health Center (NAVENVIRHLTHCEN), 2510 Walmer Avenue, Norfolk, Virginia, 23513-2617, DSN: 253-5575. Commercial: (757) 462-5575. FAX: (757) 444-3672.

**b. Non-Ionizing Radiation**

(1) **Radiofrequency (RF) and Microwave Radiation**. Radar and communications equipment (transmitters) and RF heat sealers may emit hazardous levels of RF/microwave radiation. In addition to causing biological changes, RF/microwave radiation can induce electrical currents/voltages that may cause shocks and burns, premature activation of electro-explosive devices (EEDs) in ordnance, and arcs, which may ignite flammable materials.

(a) **Radar and Communications**. Information on the hazards of electromagnetic radiation to personnel, fuels, and ordnance is available in reference B9-4, Volume I for Hazards of Electromagnetic Radiation to

05 October 2000

Personnel (HERP) and Fuels (HERF) and Volume II for Ordnance (HERO). Per reference B9-1, surveys are generally provided at the completion of acceptance trials or upon ship requests (e.g., following topside changes or changes to the ships RFR emitters). Surveys are performed to determine if the permissible exposure limits (PELs) are exceeded in normally occupied areas, particularly with respect to the established guidelines identified in B9-7. Following a survey, a complete set of RADHAZ control measures (See appendix B9-A for description) is provided to mitigate RADHAZ and to obtain a NAVSEASYS COM letter of certification. For information and technical assistance, contact COMNAVSEASYS COM (Code SEA 05K2B) or NAVSURFWARCENDIV Dahlgren (Code J52).

(b) **Heat Sealers.** Heat sealers are used to seal layers of plastic together using RF radiation and are usually found in shops that make containments and enclosures (i.e. nuclear control facilities and lagging shops).

(2) **Governing Instructions**

(a) NAVSEA OP 3565/NAVAIR 16-1-529/NAVELEX 0967-LP-624-6010 Volume I, Fifth Revision (Reference B9-4; specific to radar and communications)

(b) DODINST 6055.11 (Reference B9-5; all RFR sources). For All Other RFR Health Hazards and Surveys, Medical Examination, and Medical Surveillance Information: Bureau of Medicine and Surgery (BUMED) (MED-212), 2300 E Street NW., Washington, DC 20372-5300, DSN: 762-3448. Commercial: (202) 762-3448. Fax: (202) 762-0931.

(3) **POCs**

(a) **Radar and Communications**

1. **Technical Assistance and Reporting Authority.** Naval Sea Systems Command (SEA 05K2B), Commander, Naval Sea Systems Command Headquarters, Washington, D.C., 20362, DSN 222-3825, Commercial: (202) 692-3825

2. **RADHAZ Surveys and Technical Assistance.** Naval Surface Warfare Center, Dahlgren Division (Code J52), Commander, Dahlgren Division, Naval Surface Warfare Center, 17320 Dahlgren Road, Dahlgren, VA 22448-5100, DSN 249-3444/3446 or commercial (540) 653-3444/3446.

(b) **For All Other RFR Health Hazards and Surveys, Medical Examination, and Medical Surveillance Information.** Bureau of Medicine and Surgery (BUMED) (MED-212), Washington, DC 20372, DSN: 294-1182/1185, commercial: (202) 653-1182/1185 or Navy Environmental Health Center (NAVENVIRHLTHCEN), 2510 Walmer Avenue, Norfolk, Virginia, 23513-2617, DSN 564-4657, Commercial: (804) 444-4657.

c. **Lasers (IIIb, IV, and Military Exempt Lasers Only).** Military applications of laser systems are increasing rapidly. Common shipboard sources include laser range finders, laser guided munitions, communications equipment, fiber optics, scoring systems, landing systems and training aids. Eye injury is the prime exposure hazard with using lasers. Eye injury can occur by direct viewing or reflecting off surfaces. Users shall read and understand hazard label warnings on equipment, inclusive of visual aid pointer.

(1) **Governing Instructions.** SPAWARINST 5100.12B (Reference B9-6) and SECNAVINST 5100.14C (Reference B9-7)

(2) POC

(a) Laser Related Weapons Systems and Certification of Laser Firing Ranges. Naval Surface Warfare Center, Dahlgren, Virginia, 22448, DSN: 249-8171, Commercial: (703) 663-8171.

R) (b) For Medical and Industrial Laser Operations. Bureau of Medicine and Surgery (BUMED) (MED-212), 2300 E Street NW., Washington, DC 20372-5300, DSN: 762-3448. Commercial: (202) 762-3448. Fax: (202) 762-0931.

d. Radioactive Materials, Not Otherwise Classified

(1) The small quantities, specific activity, and physical form of radioactive materials used aboard ships usually make them non-hazardous. However, breakage and spread of even small quantities of some radioactive materials can lead to internal contamination (by ingestion, inhalation or wound contamination) in excess of allowable limits. Therefore, report all incidents of suspected or real contamination through the cognizant MDR per reference B9-8.

(2) Luminous markers, clocks, smoke detectors, compasses, depth gauges, and electron tubes may contain small quantities of radioactive material. The evaluation of such items shall consist of a simple inspection for physical damage.

(3) Some aircraft and missile construction material contains magnesium-thorium alloys. Altering this material through cutting or grinding by ship crewmembers is prohibited. Thorium containing welding rods are exempt from radioactive material permitting.

**NOTE:**

Tenders holding a Navy Radioactive Materials Permit may alter these materials per reference B9-9.

(4) Depleted uranium is used as penetrators in some munitions. All warship classes, which stow depleted uranium munitions, has been evaluated by COMNAVSEASYS COM to ensure that personnel occupying spaces immediately adjacent to the munitions storage compartment are not exposed to radiation levels exceeding that allowed for the general population.

**B0904. RADIATION HAZARD AREAS**

a. Ionizing Radiation. This chapter provides specific guidance for delineating ionizing radiation hazard areas for weapons and radiographic sources. The type and wording of each sign is dependent upon the type of radiation area. Reference B9-8, section 7-4 provides specific guidance for posting ionizing radiation hazard areas. Medical x-ray units will be posted per reference B9-8.

b. RFR Hazard Areas. RFR hazard warning signs are required at all access points to areas where the RFR levels may exceed the PEL. Obtain NAVSEA-approved warning signs and labels through the standard stock system (see appendix B9-A). When military operational considerations prevent the posting of such signs, a waiver must be obtained from cognizant occupational health and safety professionals depending upon the RFR source. Where the RFR levels may exceed 10 times the PEL, additional warning devices and controls such as

flashing lights, audible signals, barriers, and interlocks may be required, depending on the potential risk for exposure. These areas will be noted in the ship's RADHAZ and baseline industrial hygiene survey reports.

(1) **Radar and Communications**. The ship's RADHAZ Report provides detailed posting and deck marking information for radar and communications RFR hazard areas. These are also described in appendix B9-A.

(2) **Heat Sealers and Other RFR Sources**. The baseline industrial hygiene survey will provide posting requirements for other RFR hazard areas.

c. **Lasers (IIIb, IV, and Military Exempt Lasers Only)**. The LSSO is responsible for labeling lasers and posting laser hazard areas.

**B0905. MEDICAL SURVEILLANCE**

The baseline industrial hygiene survey identifies those work centers that require medical surveillance for exposure to radiation.

a. **Ionizing Radiation**. Medical surveillance of personnel exposed to ionizing radiation shall follow reference B9-8.

b. **Lasers**. The medical surveillance for lasers is specified in reference B9-10 and is limited to those personnel at risk to laser radiation. The nature of the risk is associated with accidental, acute injuries, not chronic exposure.

**B0906. RADIATION INCIDENTS**

a. In the event of a radiation incident involving ionizing radiation, reference B9-12 and chapter A6 require investigation and reporting.

b. **Radiofrequency Radiation**. Investigate and report RFR mishaps as directed in reference B9-12.

(1) Investigation of incidents involving alleged or actual RFR exposures that are five times the PEL or greater shall include, as a minimum:

- (a) A listing of all involved personnel.
- (b) Measurements of RFR exposure levels.
- (c) Results of appropriate medical examination.
- (d) A detailed description of the circumstances surrounding the incident.
- (e) Recommendations for more detailed medical follow-up if necessary.
- (f) Recommendations to prevent any future occurrence of the incident.

(2) Using the format listed in the previous paragraph, the commanding officer shall submit a message report to BUMED, Washington, D.C. (MED-212) within 48 hours for any of the following situations:



(a) For each exposure incident which is five times the PEL or greater.

(b) There is injury to personnel or personnel demonstrate physical symptoms believed associated with RF exposure.

(c) Inadvertent exposure occurred to members of the general public or to other noninvolved personnel as a result of naval operations that exceeded the appropriate controlled PEL.

A) (d) If exposure incident requires service member to miss five working days, a mishap report must be submitted in accordance with chapter A6.

c. **Laser Radiation (Specific Actions Described in Reference B9-11)**

(1) If an eye injury is suspected or observed from exposure to laser radiation, medical examination by an ophthalmologist or optometrist is required within 24 hours of the exposure if operational requirements allow or as soon as possible.

(2) Submit a report of the exposure incident to the BUMED (MED-212) within 30 days of the incident, with the following information as a minimum:

(a) List of personnel involved

(b) Estimation of exposure(s) as related to the applicable PEL

(c) Details of immediate and subsequent medical findings

(d) Narrative account/summary of exposure incident—to include wavelength, mode of operation(s) and energy/power output

(e) Details regarding safety procedures and equipment used.

A) (3) If exposure incident requires service member to miss five working days, a mishap report must be submitted in accordance with chapter A6.

---

**CHAPTER B9**

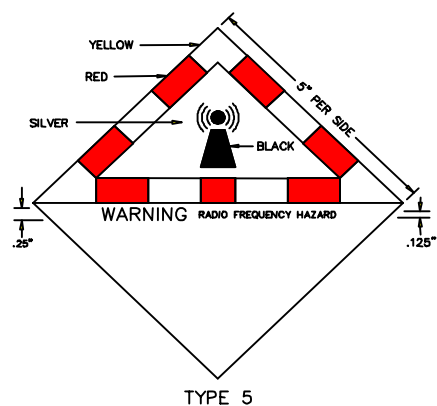
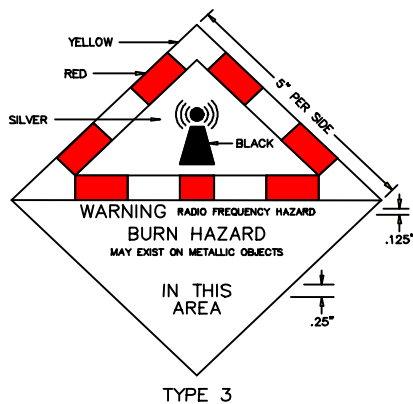
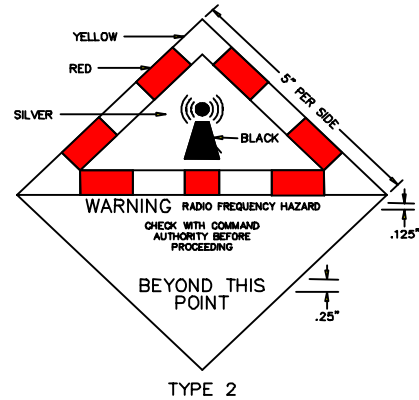
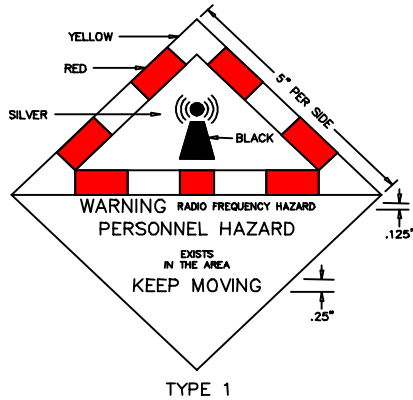
**REFERENCES**

- B9-1 BUMEDINST 6470.22. Navy Radiological Systems Performance Evaluation Program, 18 Apr 00
- B9-2 NAVSEA S0420-AA-RAD-010. Radiological Affairs Support Program (RASP) Manual, 01 Oct 91 (NOTAL)
- B9-3 NAVSEA S9040-AA-GTP-010/SSCR, Shipboard Systems Certification Requirements for Surface Ship Industrial Periods (Non-Nuclear), Revision 3 of Jun 90 (NOTAL)
- B9-4 NAVSEA OP 3565/NAVAIR 16-1-529/NAVELEX 0967-LP-624-6010. "Electromagnetic Radiation Hazards (Hazards to Personnel, Fuel, and other Flammable Material)" (NOTAL)
- B9-5 DoD Instruction 6055.11. Protection of DoD Personnel from Exposure to Radiofrequency Radiation of 20 August 86 (NOTAL)
- B9-6 SPAWARINST 5100.12B. Navy Laser Radiation Hazards Prevention Program (NOTAL)

- B9-7      SECNAVINST 5100.14C.    Military Exempt Lasers (NOTAL)
- B9-8      NAVMED P-5055.    "Radiation Health Protection Manual" (NOTAL)
- B9-9      OPNAVINST 6470.3.    Navy Radiation Safety Committee (NOTAL)
- B9-10     DOD 6055.5-M, "Occupational Health Surveillance Manual", Authorized (R  
by DoD Instruction 6055.5, 10 Jan 89 (NOTAL)
- B9-11     BUMEDINST 6470.23, "Medical Management of Non-Ionizing Radiation  
Casualties".
- B9-12     OPNAVINST 6470.2A.    Occupational Radiation Protection Program (NOTAL)

Appendix B9-A

SIGNS AND STOCK NUMBERS



- a. Illustration page describing the warning sign formats (See next page).
- b. Description of types of RADHAZ control measures and deck marking information (See following text).

National Stock Numbers (NSNs):

Type 1 - 7690-01-377-5893

Type 2 - 7690-01-377-5895

Type 3 - 7690-01-377-5896

Type 5 - 7690-01-377-5374

05 October 2000

## **RADHAZ WARNING SIGN FORMATS**

### **CONTROL MEASURES AND DECK MARKINGS:**

#### **RADHAZ Warning Signs**

RADHAZ warning signs have been developed to advise personnel of the hazards of electromagnetic radiation. The format of these signs conforms with national and international standards. The RADHAZ warning sign formats are provided along with the National Stock Numbers (NSNs) in the above figure.

##### **Type 1 Warning Sign**

The Type 1 warning sign advises personnel not to linger in the area surrounding HF antennas where the PEL can be exceeded. The sign informs personnel of an RF hazard in the area and to keep moving. This sign is posted at a boundary of an area where the PEL can be exceeded. Personnel may pass through this area, but must not linger. If personnel are required to remain in the area, they must contact appropriate personnel who will ensure that operational procedures are implemented to limit RF exposure to a level below the PEL.

##### **Type 2 Warning Sign**

The Type 2 warning sign excludes personnel from proceeding past a designated point. The sign informs personnel to check with command authority before proceeding beyond this point. This sign is normally posted at access points to high-power antenna systems, such as the access to the mast or high-power HF communication antennas which are often located in the vicinity of normally occupied areas.

##### **Type 3 Warning Sign**

The Type 3 warning sign informs personnel that an RF burn hazard may exist on metallic objects in this area. The Type 3 sign is used to denote RF hazards due to contact with metallic objects in the area and is normally posted on the metallic object that presents the worst hazard. Personnel should be aware that this hazard may also exist on other metallic objects in the area. An RF burn hazard may exist when either the RF voltage or contact current PEL is exceeded. Additional RADHAZ control measures may be required to ensure that this hazard is limited to levels that do not exceed PELs on metallic objects that personnel must grasp, such as signal lights and binoculars.

##### **Type 5 Warning Sign**

The Type 5 warning sign provides a blank area in which special instructions necessary for safe operations can be typed. Often this sign provides operators and maintenance personnel with specific frequency and/or power limitation information for the safe operation of the antenna systems associated with the RF transmit equipment. The Type 5 sign may also be used

to inform personnel to contact command authority prior to operation of equipment to prevent an RF hazard to the operator or other personnel. The Type 5 sign should be posted in clear view of system operators.

### **PEL line**

A PEL line is used to mark a deck area where precautionary measures are required to minimize the possibility that personnel can be exposed to RFR in excess of the PEL. The PEL line is a 4-inch wide, red line (usually a circle or semicircle) painted on the deck to mark the boundary of an area surrounding an antenna where the PEL can be exceeded. When a PEL line is used, a Type 1 RADHAZ warning sign is posted to advise personnel that a hazard may exist and that they must keep moving. Personnel outside the PEL line need not take precautionary measures; however, when it is necessary for personnel to be within the marked areas, they must contact appropriate personnel who will ensure that operational procedures are implemented to limit RF exposure to a level below the PEL.

### **Red Warning Bands**

A red warning band is used to mark a safety rail where precautionary measures are required to minimize the possibility of personnel exposure to contact currents in excess of the PEL. The red warning band is a 4-inch wide, red line painted on the top of the safety rail to mark the boundary of an area in proximity to an antenna where the PEL can be exceeded. Where a red warning band is used, a Type 3 RADHAZ warning sign is posted to advise personnel that an RF burn hazard may exist.

### **Personnel Barriers**

Personnel barriers are any devices that restrict personnel access to an antenna or area where the PEL can be exceeded. The personnel barrier may be a fixed barrier, such as a permanent fenced area around an antenna. If no access to the antenna is provided, RADHAZ warning signs are not required. If there is an access opening, a temporary barrier (i.e., nylon rope) may be used to restrict personnel access. In this case, a Type 2 warning sign is also posted on a placard which is normally attached to the nylon rope.

### **Frequency and/or Power Management**

Frequency and/or power restrictions may be utilized to limit RF levels in excess of the PEL to an acceptable level. This management technique may be used to limit RF levels within a RADHAZ area defined by PEL lines or to limit RF contact current on items that personnel are required to grasp while performing their assigned task. The HERP/HERF test report provides specific guidance for operating procedures. These procedures may include one or more of the following:

- a. Refrain from using the antenna,
- b. Reduce power for the frequencies at which the PEL is exceeded, and
- c. Refrain from using frequencies at which the PEL is exceeded.

OPNAVINST 5100.19D  
05 October 2000

Type 5 warning signs are used to provide operator or maintenance personnel with the frequency and/or power management requirements.

05 October 2000

**CHAPTER B10****LEAD CONTROL****B1001. DISCUSSION**

a. The purpose of this chapter is to prevent lead intoxication and related injuries during the use, handling, removal and melting of materials containing lead.

b. In this chapter, "lead" means metallic lead, all inorganic lead compounds, and organic lead soaps. Lead's low melting point, high molecular weight, high density and malleability make it useful structural material. When added to resins, grease, or rubber, lead compounds act as antioxidants. Common uses for lead and lead compounds include ballast, radiation shielding, paint filler and hardener, rubber and pipe joints, high voltage cable shielding, small arms ammunition, batteries and weights. While not an absolute indicator, red, forest green, chrome yellow and "school bus" yellow color paints typically contain lead compounds. Lead may also be found in polyurethane and water based paints.

c. Significant lead exposures can occur during: lead and babbitt melting and casting; ballast handling; spraying, sanding, grinding, burning, and abrasive blasting of lead-containing materials and lead-containing paint; brazing with torches; high voltage cable repair; abrasive blasting with smelting slag; lead-acid battery reclaiming; machining lead; disassembly of gasoline engine components (which have used leaded gasoline); and handling of contaminated personal clothing.

d. Lead is a recognized health hazard. Lead may adversely affect the peripheral and central nervous systems, as well as the red blood cells, kidneys, reproductive and endocrine systems.

e. In recognition of the serious health hazards associated with lead and the numerous sources of potential lead exposure, the Navy has established strict controls to limit both occupational and environmental exposures. Standards and controls discussed in this chapter shall be applicable to all Navy personnel.

**B1002. PERMISSIBLE EXPOSURE LIMIT AND ACTION LEVEL TRIGGERING REQUIREMENTS**

a. **Permissible Exposure Limit (PEL)**. The PEL for an 8-hour time-weighted average (TWA) exposure to airborne lead is 50 micrograms per cubic meter ( $\text{ug}/\text{m}^3$ ) of air.

b. **Action Level (AL)**. The AL for an 8-hour TWA exposure to airborne lead is  $30 \text{ ug}/\text{m}^3$  (without regard to respirator use).

c. **Biological monitoring and medical surveillance** shall be initiated when an employee's exposure exceeds the AL for more than 30 days per year.

05 October 2000

d. **Engineering and administrative controls** shall be initiated when an individual's exposure exceeds the PEL for more than 30 days per year. When a person's exposure is greater than the AL, but less than the PEL, engineering controls shall be initiated to reduce the workplace environmental level to a maximum of 200 ug/m<sup>3</sup>. Thereafter, any combination of engineering and administrative controls may be used to maintain exposure at or below the PEL.

**B1003. LEAD CONTROL RESPONSIBILITIES**

a. **Commanding Officers shall** not authorize paint removal for cosmetic reasons or due to excessive paint thickness. They may only authorize paint removal to protect the ship from corrosion, when incidental to hot work, and when bare metal is required for an inspection.

b. **The safety officer shall:**

(1) When applicable, as determined by the baseline industrial hygiene survey, establish effective shipboard lead control practices that include as a minimum those elements in paragraph B1004.

(2) Verify that the ship has the proper clothing and equipment aboard to protect personnel during shipboard lead work.

(3) Notify the commanding officer when sufficient funds are unavailable to obtain mandatory protective clothing and equipment to protect ship's force personnel during shipboard lead work.

(4) If specified in the baseline industrial hygiene survey, ensure a written compliance plan to comply with lead control requirements is available. The supporting industrial hygiene officer/industrial hygienist shall prepare this plan.

(5) Implement lead hazard training for all personnel identified in the baseline industrial hygiene survey as potentially exposed to lead at or above the AL.

(6) Request industrial hygiene assistance for the evaluation of new potential lead hazards.

c. **Division officers shall:**

(1) Ensure that personnel required to perform work involving lead exposure are provided with proper clothing and equipment and trained in its use.

(2) Ensure that personnel who work with lead or who work in areas where the potential exists for lead exposure at or above the AL are properly trained.

(3) Identify to the medical department representative (MDR), personnel who work with lead or who work in areas where the potential exists for lead exposure at or above the AL.



d. **The MDR shall:**

(1) Assist the safety officer with conducting lead hazard training upon request.

(2) Schedule personnel for blood lead analysis and physical examinations at shore medical activities as required for medical surveillance.

e. **All hands shall:**

(1) Obtain and properly use protective equipment and use safe work practices as trained when working with lead.

(2) Report for medical surveillance tests and examinations, when scheduled.

**B1004. LEAD CONTROL ELEMENTS**

The following elements, as a minimum, are necessary to carry out effective lead control:

- a. Industrial hygiene survey (paragraph B1005)
- b. Control of lead in the workplace environment (paragraph B1006)
- c. Waste disposal procedures (paragraph B1007)
- d. Medical surveillance (paragraph B1008)
- e. Written compliance plan (paragraph B1009)
- f. Worker and supervisor training (paragraph B1010)

**B1005. INDUSTRIAL HYGIENE SURVEY**

a. An industrial hygienist shall evaluate all workplaces in which lead is used. This evaluation shall be accomplished during the baseline industrial hygiene survey specified per chapter A3. Where a potential for exposure from inhalation of airborne lead particulate or personnel contamination is found, the industrial hygienist shall establish an exposure monitoring plan to characterize personnel exposures. When personnel lead exposures warrant, the industrial hygiene survey shall identify the need for the command to have a written lead hazard compliance plan and provide the specific content for the plan.

b. Within 5 working days after the receipt of exposure monitoring results, the command shall notify affected personnel in writing of results that represent their exposure. Whenever the results indicate that the individual was exposed above the PEL, without regard to respirator use, the written statement shall include that fact and a description of the corrective action(s) taken to reduce the individual's exposure.

05 October 2000

c. If the safety officer or any supervisor has a question regarding the potential lead hazards and appropriate controls involving an operation which includes or potentially includes lead, the safety officer shall request industrial hygiene officer assistance from a tender, staff or local medical treatment facility or Navy Environmental and Preventive Medicine Unit (NAVENPVNTMEDU).

**B1006. CONTROL OF LEAD IN THE WORKPLACE ENVIRONMENT**

There are seven basic principles to be used when working with lead or materials that contain lead:

a. **General Workplace Control Practices**

(1) Use non-lead paint.

(2) Keep mechanical grinding and sanding to the absolute minimum with primary reliance on impact tools and authorized chemical strippers for paint removal. Mechanical tools equipped with high efficiency particulate air (HEPA) filtered exhaust for removal and reclamation of lead dust are preferred.

(3) When feasible, minimize the heating of lead and leaded materials by using thermostatically-controlled heating (below 600°F) or removing the lead-containing surface coatings or contaminants prior to heating.

(4) Establish procedures to maintain work surfaces as free of lead dust as is practical. Clean up lead dust with a HEPA filtered vacuum cleaner. Wet sweeping, wet brushing and wiping down with wet rags may be effective in removing lead dust. Rags used for wiping down shall be disposed of as lead waste.

(5) Lead-containing waste, scrap, debris, containers, equipment and clothing consigned for disposal shall be collected, sealed, and labeled in impermeable containers. Transportation shall be conducted in a manner that does not release airborne dust or pollute surrounding waterways. Dispose of lead waste per the procedures of chapter B3.

(6) To minimize exposure potential, isolate hot work on lead and abrasive lead removal operations from other operations.

b. **Ventilation**

(1) If deemed necessary by the cognizant industrial hygienist, provide fixed local exhaust ventilation connected to high efficiency particulate air filters at the point of particulate generation.

(2) Do not exhaust emissions to another workspace.

c. **Personal Protective Clothing and Related Control Facilities**

(1) Personnel engaged in the handling of lead or in situations where the concentration of airborne particulate lead is likely to exceed the PEL, or

where the possibility of skin or eye irritation exists shall remove uniform clothing and wear protective clothing. Consult the command's industrial hygiene officer, industrial hygiene survey, or contact the local BUMED industrial hygienist for specific clothing requirements. Clothing shall be waterproof when wet lead is handled.

(2) Personnel shall remove protective clothing before leaving the work area.

(3) Provide change rooms as close as practical to the lead work area(s) for personnel who work where the airborne lead exposure is above the PEL (without regard to the use of respirators). When possible, locate shower facilities between the "clean" and "dirty" change rooms. Consult the command's industrial hygiene officer, industrial hygiene survey, or contact the local BUMED industrial hygienist for specific decontamination facility requirements.

(4) Launder lead-contaminated clothing to prevent release of lead dust in excess of the AL. Transport lead-contaminated clothing in sealed containers to which are affixed the standard "caution label" (see paragraph B1006e). Notify persons who clean or launder protective clothing or equipment in writing of the potentially harmful effects of exposure to lead and monitor these persons for exposure to lead as required by paragraph B1005.

d. **Respiratory Protection**

(1) Respirators are required where the concentration of airborne, particulate lead is likely to exceed the PEL.

(2) Consult the command's Respiratory Protection Program Manager, industrial hygiene survey, or contact the local BUMED industrial hygienist for specific respirator requirements.

e. **Warning Signs and Caution Labels**

(1) **Warning signs** shall be provided and displayed at each location where airborne lead concentrations may exceed the PEL. Signs shall state, as a minimum, the following:

**WARNING**

**LEAD WORK AREA**

**POISON**

**NO SMOKING, EATING OR DRINKING**

(2) **Caution labels** shall be affixed to containers of lead-contaminated clothing and equipment, raw materials, waste, debris, or other products containing lead. These caution labels shall state:

05 October 2000

**CAUTION**

**CLOTHING CONTAMINATED WITH LEAD**

**DO NOT REMOVE DUST BY BLOWING OR SHAKING**

**DISPOSE OF LEAD CONTAMINATED WASH WATER ACCORDING TO**

**APPLICABLE LOCAL, STATE OR FEDERAL REGULATIONS**

f. **Housekeeping**

(1) Where lead containing materials are routinely melted, ground or cut, maintain all surfaces as free as practical of lead accumulation. Clean surfaces at least once per shift to prevent accumulation of lead dust.

(2) All cleaning shall use methods such as vacuuming with HEPA filtered vacuum cleaners or washing down where feasible, observing water pollution regulations as they pertain to lead-contaminated wastewater. Only use wet sweeping, shoveling or brushing shall when other methods have been tried and found to be ineffective or infeasible.

(3) Do not use compressed air to clean work surfaces.

(4) When wash down procedures are used to clean surfaces or wetting is used to control dust, treat floor surfaces with a non-skid agent and drain the floor so that excess water is collected in a holding tank for disposal per chapter B3.

g. **Personal Hygiene**

(1) Prohibit eating, drinking, smoking, chewing of tobacco products or gum, the application of makeup, and storage of food and tobacco products in lead work areas.

(2) Personnel working with lead shall wash their hands and faces prior to eating, drinking, smoking or applying cosmetics.

**B1007. WASTE DISPOSAL PROCEDURES**

a. Lead-containing waste materials are classified as hazardous material and must be handled per chapter B3. Bag hazardous lead waste in heavy-duty plastic bags or other impermeable containers. Label bags with caution labels described in paragraph B1005e(2).

b. Label containers such as bags and trash cans "**LEAD WASTE ONLY.**" Care must be exercised in order to prevent bags and other containers from rupturing when being moved.

**B1008. MEDICAL SURVEILLANCE**

a. Medical surveillance consists of: preplacement medical evaluation, blood lead monitoring, and follow-up medical evaluation based on the results

of blood lead analysis, worker complaint, and physician opinion. Personnel are included in this program when industrial hygiene surveillance indicates that they perform work or are likely to be in the vicinity of an operation which generates airborne lead concentrations at or above the AL more than 30 days per year. Inclusion in this program is based on measured airborne concentrations without regard to respirator use, and therefore does not indicate that an individual is overexposed to lead.

b. Within 5 days of receipt of blood lead monitoring results, the command shall notify affected personnel in writing of his/her blood lead if their blood lead level is at or above 30 ug/100gm. Notification should include the criteria for removal from lead work and, if appropriate, notification that the person is being temporarily removed from lead exposure per reference B10-1. If an individual is pregnant, she should be counseled on the possible adverse affects to the pregnancy or fetus. A decision regarding any action to be taken will be made by the physician on a case-by-case basis.

c. All records of examinations, possible lead-related conditions, related laboratory results and all forms and correspondence related to the person's medical history shall become a permanent part of the health record and be retained for the period of naval service plus 20 years, or 40 years after the date of the last entry, whichever is longer.

**B1009. WRITTEN COMPLIANCE PLAN**

The supporting industrial hygiene officer or industrial hygienist shall prepare a written compliance plan for processes that produce exposures in excess of the PEL as specified in reference B10-1. The ship only needs a lead compliance plan if lead processes are identified during the baseline industrial hygiene survey. These plans shall include the following items, at a minimum:

a. A description of each operation in which lead is emitted; e.g. machinery used, material processed, controls in place, crew size, employee job responsibilities, operating procedures and maintenance practices

b. A description of the specific means that will be employed to achieve compliance, including engineering plans and studies used to determine methods selected for controlling exposure to lead

c. A report of the technology considered in meeting the permissible exposure limit

d. Air monitoring data that documents the source of lead emission;

e. A detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.

f. A work practice program which includes items required under paragraphs (g), (h) and (i) of reference B10-1

05 October 2000

g. An administrative control schedule required by paragraph (e) (6) of reference B10-1, if applicable

h. Other relevant information.

The supporting industrial hygiene officer/industrial hygienist shall review written plans and update as necessary at least every 6 months to reflect the current status.

**B1010. TRAINING**

a. All personnel who are potentially exposed to lead at or above the AL, and their supervisors shall receive initial training prior to such assignment and at least annually thereafter. This training shall, at a minimum, include the following:

(1) The specific nature of operations during which exposure is possible.

(2) The purpose, proper selection, fit testing, use and limitations of respirators.

(3) The adverse health effects of lead with particular attention to the reproductive effects upon both males and females, including the possible adverse effects on pregnancy and the fetus.

(4) The purpose and description of the medical surveillance program, including the use of chelating agents.

(5) The engineering controls and work practices to be applied and used in the work, including personal protective equipment and personal hygiene measures.

(6) The contents of any compliance plan in effect.

**NOTE**

The command shall procure sufficient copies of reference B10-1 from the Department of Labor and make them available to personnel required to receive training. They should be provided with appendix B (Employee Standard Summary) of reference B10-1 and, upon request, any other handout-type materials used in or related to the training.

b. All painted surfaces that cannot be identified as lead-free through laboratory analysis must be handled as containing lead. Division officers shall train personnel assigned to remove paint per the safety precaution for paint removal in chapters C18 and D12.

**CHAPTER B10**

**REFERENCES**

- B10-1 29 Code of Federal Regulations (CFR) 1910.1025, Lead (As Amended)  
(NOTAL - This reference should be ordered by commands, as appropriate,  
to provide to personnel under medical surveillance (see paragraph  
B1008). Commands with an industrial hygiene officer as safety officer  
shall have this reference aboard).

05 October 2000

**CHAPTER B11****TAG-OUT****B1101. DISCUSSION**

a. A tag-out procedure is necessary because of the complexity of modern ships and the cost, delays, and hazards to personnel which could result from improper operation of equipment or the inadvertent release of stored energy. In order to prevent injury to personnel and damage to equipment, the tag-out program is mandatory for all-shipboard equipments, components, and systems. The program is designed to notify personnel that tagged-out equipment or systems are not in a normal operating condition. The tag-out procedure consists of a series of tags or adhesive labels that are applied to instruments, gages, or meters to indicate that they are inoperative, restricted use, or out of calibration. Each tag contains information necessary to avoid a possible mishap. Standard tag-out procedures are to be used for all corrective maintenance including work done by an intermediate maintenance or depot level repair activity. Tag-out procedures shall be enforced at all times. The use of tags or labels is not a substitute for other safety measures such as chaining or locking valves, removing fuses, or racking out circuit breakers. If any system, portion of a system, component, equipment, or instrument has more than one type of tag or sticker, the **DANGER (RED)** tag, when present, shall take precedence over all other tags or stickers.

b. Reference B11-1 (Tag-Out User's Manual) is the primary technical reference for all tag-out procedures conducted by ship's crew.

**B1102. TAG-OUT SUBSECTIONS**

The following subsections apply to tag-out:

- a. Training and Qualifications. (reference B11-1, paragraph 1.4)
- b. Planning Tag-outs. (reference B11-1, paragraph 1.5)
- c. Establishing Tag-outs. (reference B11-1, paragraph 1.6)
- d. Maintaining Tag-outs. (reference B11-1, paragraph 1.7)\_
- e. Clearing Tag-outs. (reference B11-1, paragraph 1.8)\_
- f. Planned Maintenance System Tag-out Procedure. (reference B11-1, paragraph 1.9)
- g. Out of Calibration/Out of Commission Labels. (reference B11-1,



OPNAVINST 5100.19D

05 October 2000

paragraph 1.10)

---

## **CHAPTER B11**

### **REFERENCES**

B11-1 NAVSEA S0400-AD-URM-010/TUM, "Tag-Out User's Manual"

## CHAPTER B12

### PERSONAL PROTECTIVE EQUIPMENT

#### B1201. DISCUSSION

This chapter provides procedures for provision and use of personal protective equipment (PPE). Chapters 1, 3, 4, 5, 6, 8, 9 and 10 of the B section of the manual contain more detailed instructions for use and maintenance of certain specialized equipment.

PPE establishes a "last line of defense" against workplace hazards, and in some cases, may be the only means of protection. Any personal protective equipment breakdown, failure, or misuse immediately exposes the wearer to the hazard. Many protective devices, through misapplication or improper maintenance, can become ineffective without the knowledge of the wearer. For this reason, proper equipment selection and maintenance, personnel training (including equipment limitations), and enforcement of protective equipment maintenance, configuration, and use are key elements to an effective personal protective effort.

#### NOTE:

Preparation for any availability should include careful assessment PPE needs over the entire period to ensure an adequate supply.

#### B1202. RESPONSIBILITIES

a. The commanding officer shall ensure that there is sufficient PPE aboard to meet the needs of his/her command. He/she shall ensure that adequate funding is provided to obtain or replace missing or worn out personal protective equipment.

b. The safety officer shall ensure that the use of PPE is monitored for required work or in required spaces, as well as being worn in a proper and effective manner.

c. Division officers shall stock personal protective clothing and equipment and shall provide it to personnel as needed. Division officers shall ensure that the supply officer is aware of required changes to the allowance of PPE so that Coordinated Shipboard/Shore-based Allowance List (COSAL), Allowance Parts List (APL) or Authorized Equipment List (AEL) can be changed accordingly. Once equipment is acquired, division officers shall ensure that it is properly maintained. Additionally, division officers shall ensure that assigned personnel are adequately trained on the type and proper use of PPE required at their work stations and shall enforce the proper use and wear of protective equipment.

d. All hands shall ensure that they wear the required PPE to perform assigned work in a proper manner. If the required equipment is not available to do the assigned work, or if instruction is needed on how to wear or use the equipment, the affected person shall notify his/her supervisor immediately.

#### B1203. PROTECTIVE EQUIPMENT

a. Head Protection. Helmets or hard hats protect crew members from the impact of falling and flying objects, from impact with low overheads, and on a limited basis from electric shock and burn. Metal hard hats are not

05 October 2000

acceptable for shipboard use. See appendix B12-A for stock number information for hard hats. Stow helmets or hard hats in a manner so that cracks will not develop in hat material. Do not stow heavy materials atop composite material hard hats.

Do not wear hard hats if cracked, if the hat material has a hole other than one caused by the manufacturer or if painted. Such hard hats will be turned in and replaced. Do not drill any holes in hard hats or modify them in any way. Such action will greatly reduce the protective capability of the headwear. Affixing decals on protective headwear is permitted.

b. **Foot Protection.** Shipboard environments such as flight decks, hangar decks, machine shops, pipe shops, heavy supply parts stowage areas, replenishment areas, and rigging sponsons expose personnel in some degree to foot hazards. Leather shoes are required for all personnel aboard ship for normal daily wear. CORFAM® (or equivalent) shoes may only be worn when immediately departing or returning to the ship or when specifically authorized by the commanding officer for ceremonial or other special occasions. Do not wear CORFAM® (or equivalent), plastic, synthetic or vinyl shoes in firerooms, main machinery spaces or in hot work areas. Several types of safety shoes are available:

(1) Standard stock safety shoes, with built-in toe protection and non-slip soles, are intended primarily to provide protection from falling and rolling objects. Enlisted personnel are issued safety shoes at Recruit Training Commands. When safety shoes exhibit wear such that safety protection is no longer afforded the command shall provide standard stock safety shoes as organizational clothing (similar to coveralls or foul weather gear). Officers shall be provided standard stock safety shoes when required by their work.

Safety shoes should be periodically examined for worn soles and heels that would reduce the non-skid features of the shoe. Safety shoes shall be replaced when the upper leather is worn or develops cracks exposing the toe protection or the foot.

(2) Special safety shoes:

(a) Semi-conductive safety shoes are used to dissipate static electricity.

(b) Safety shoes with special electrical hazard soles are used to guard against shock hazards when performing electrical work and shall be provided to EMs, ETs, and personnel working around high voltage.

(c) Safety shoes or boots with rubber or synthetic material are used for protection against acids, caustics and other liquid chemical hazards. They may or may not have toe protection.

(d) Molders boots, with toe protection, should be provided to welders to provide easy removal in case hot slag or metal drops in or on the boot.

Protective shoes shall be stowed in a dry atmosphere. Where practical, they shall be stowed upright, allowing the insides to dry out.

(3) See appendix B12-A for stock number information for foot protection equipment.

c. **Hand Protection.** Hand hazards include handling sharp objects, working with chemicals or electrical equipment and hot work. The following guidance is provided:

(1) When handling sharp materials, wear leather gloves. Also wear leather gloves over electrical grade rubber gloves whenever the rubber gloves could be subjected to cutting by sharp or abrasive objects.

(2) Whenever it is necessary to work with portable electric tools or equipment in damp locations or when it is necessary to work on live electrical circuits or equipment, wear electrical grade insulating rubber gloves.

(3) Wear only gloves approved to handle acids, corrosives, solvents, and other industrial chemicals when required. The safety officer or hazardous material coordinator shall assist supervisors in the selection of gloves to protect against chemical hazards. Surgical or foodhandler type gloves are not approved for use with toxic materials.

(4) When it is necessary to handle hot items or perform hot work, even if tongs or other gripping/clamping tools are available, wear non-asbestos, insulated gloves.

(5) Do not wear gloves when operating machinery with rotating or moving parts.

(6) See appendix B12-A for stock number information on hand protection equipment.

(7) Stow rubber electrical insulating gloves in the box in which they came. Perform Planned Maintenance System (PMS) on the gloves prior to stowage. Stow other rubber electrical safety protection equipment in a clean, dry, oil-free location. Care should be taken not to fold such equipment as folding will frequently result in cracks that will greatly reduce the insulating capability of the material.

(8) Do not use electrical insulating gloves for non-electrical work such as; general cleaning with cleansers, work involving solvents, work involving alkali material, or work involving acids. Cleaning products, acids and alkalis will degrade the insulating properties of the gloves making them unsafe for electrical work.

d. **Safety Clothing.** Special clothing may consist of flameproof coveralls, disposable coveralls, impervious chemical spill coveralls, welding leathers, and chemical aprons. These items may be specified as required by annual safety zone inspections, baseline industrial hygiene surveys, or standard work practices. Special clothing is required for personnel involved in asbestos ripout (see chapter B1). Synthetic clothing, such as certified Navy twill (CNT), may only be worn when immediately departing or returning to the ship or when specifically authorized by the commanding officer for ceremonial or other special occasions. See appendix B12-A for stock number information on safety clothing.

Stow leather protection equipment in a clean, dry atmosphere. Dry gloves prior to stowing, preferably in the boxes supplied with them. Hang up welding leathers.

e. **Personal Fall Protection Equipment.** When climbing, working aloft or over the side, wear a parachute-type (full body) safety harnesses with Dyna-

05 October 2000

Brake® safety lanyard at all times. Additionally, use the following actions to provide maximum protection:

- (1) Use wire rope instead of nylon line when doing hotwork.
- (2) Inspect safety harnesses, D-rings, and safety lines before each use.
- (3) Ships shall train personnel who work aloft or over the side in the proper use of personal fall protection equipment.
- (4) Do not use safety lanyards for any other purpose than personal fall protection. In particular, do not use them for hoisting heavy objects.
- (5) See appendix B12-A for stock number information on personal fall protection equipment.

Hang lanyards and safety harnesses used for personal fall protection equipment in a cool, dry atmosphere. Do not pile equipment one upon the other. Such action may prevent proper drying and result in rotting and weakening of lanyards.

f. **Personal Flotation Devices.** Whenever personnel other than aircrew members and flight deck personnel are required to wear life jackets in open sea operations, the life jackets must be inherently buoyant. Those jacket-type life preservers are used by personnel in exposed battle stations, when working over the side, topside in heavy weather, during replenishment at sea, and in small boats. See appendix B12-A for stock number information on personal flotation devices.

Thoroughly dry life jackets prior to stowage. Following drying, stow them in designated clean and dry locations. Hang flight deck, MK-1 inflatable life jackets in a clean, dry atmosphere.

**Appendix B12-A**

**PERSONAL PROTECTIVE EQUIPMENT STOCK NUMBER INFORMATION**

<b>ITEM</b>	<b>NSN*</b>
1. Head Protection:	
Hard Hat	8415-01-025-9958
Helmet, Flight Deck Crew Cloth	8415-00-861-3527
Pad, Back Assembly	8415-00-178-6830
Pad, Front Assembly	8415-00-178-6831
Shell Assembly, Front	8415-00-178-7013
Shell Assembly, Back	8415-00-178-6855
2. Safety Shoes:	
Steel Tip	8430-00-596-5396 through 6052 8430-01-032-2900 through 2909 8430-01-079-1252, MIL-S-21894
Steel Tip Boots	8430-00-624-2151 (series)
Molder's	8430-00-926-9966 (series)
Electrical	8430-00-611-8314 (series)
Rubber	8430-00-624-2151 (series)
3. Gloves:	
Leather	8415-01-092-3910
Butyl	8415-00-753-6551 through 6554
Industrial (corrosive handling)	8415-00-266-8673, 8675, 8677, 8679
Industrial (organic solvent handling)	8415-00-823-7456, 7457
Neoprene	8415-00-753-6551 through 6553
PVC	8415-00-916-2817, 2818
Rubber (chemical handling)	8415-00-753-6651 through 6654
Rubber latex	8415-01-012-9294
Protective Fuel and Oxidizer Resistant (Resin Modified Butyl)	8415-00-577-4091 (series)
Chipper, Gauntlet Left	8415-00-559-1339 (series)

\* National Stock Numbers (NSN) are subject to change. Recheck Numbers prior to ordering.

**Appendix B12-A**

**PERSONAL PROTECTIVE EQUIPMENT STOCK NUMBER INFORMATION**  
**(Continued)**

<b>ITEM</b>		<b>NSN</b>
	Chipper, Gauntlet Right	(series)
	Cotton, Work	8415-00-268-8330
	Cloth, leather palm	8415-00-268-8350
	Leather, Welder, Gauntlet	8415-00-269-0432 (series)
	Leather, heavy	8415-00-268-7871 (series)
	Leather, Gauntlet, Linesman	8415-00-274-2432 (series)
	Cotton Knit, Fire Retardant	8415-00-024-9505
	Heat Protective Mitten	8415-01-092-0039
	Rubber, Electrical Insulating	8415-01-158-9445 through 9449
4.	Safety	
	Clothing:	
	Butyl apron	8415-00-281-7813 through 7815
	Plastic apron	8415-00-715-0450
	Rubber apron	8415-00-082-6108
	Boot covers, butyl	8430-00-262-5295 through 5297
	Boot covers, disposable	8430-00-591-1359
	Coveralls, toxicological	8415-00-099-6962, 6968, 6970
	Coverall, white cloth	8405-00-082-5536 through 5539
	Coveralls (fire retardant)	8405-01-105-6138 (series)
	Coveralls, Catapult Crewman	8415-00-753-6346 (series)
	Coveralls, Cotton Sateen (Maintenance)	8405-00-131-6507 (series)
	Coveralls, Microwave Radiation Protection	8415-00-006-7770 (series)
	Coveralls, Arc Protection	8415-00-081-6481 (series)
	Footwear, Disposal Covers (used for OTTO II handling and with microwave protection coveralls)	0430-00-591-1359 (series)

**Appendix B12-A**

**PERSONAL PROTECTIVE EQUIPMENT STOCK NUMBER INFORMATION**

(Continued)

<b>ITEM</b>		<b>NSN</b>
	Coveralls, Explosive Handling	8415-00-280-2455 (series)
	Coveralls, Rocket Fuel Handlers	
	Impermeable Full Protection	8415-00-725-3627 (series)
	Hood, Rocket Fuel Handlers, Impermeable	8415-00-753-6210
	Clothing, leather (for welders)	
	Sleeves	8415-00-164-0513
	Jacket	8415-00-268-8262 (series)
	Apron	8415-00-250-2531
5.	Personal Fall Protective Equipment:	
	Safety Harness Complete Assembly (work/safety lanyard)	4240-00-402-4514
	Safety Harness	4240-00-022-2522
	Working lanyard, Nylon	4240-00-022-2518
	Safety lanyard, 1/2" Nylon Rope with Dyna-Brake®	4240-00-022-2521
	Safety lanyard, 1" Strap Nylon with Dyna-Brake®	4240-00-022-2521
	Climber Safety Sleeve	4240-01-042-9688
6.	Personal Flotation Devices:	
	Life Preserver, Vest, Foam Pack (Inherently Buoyant)	4220-00-200-0538
	Life Preserver, Steinke Hood	4220-00-066-4396
	Life Preserver, Vest MK1 Vest	
	Vest	4220-00-926-9459 (series)
	Bladder	4220-00-935-5528
	Inflation Assembly	4220-00-012-3571